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SANITATION

DECEMBER 1993

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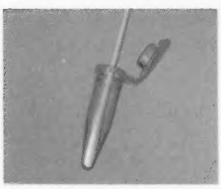

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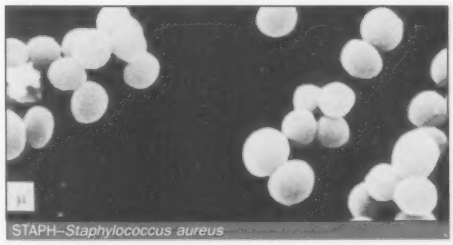
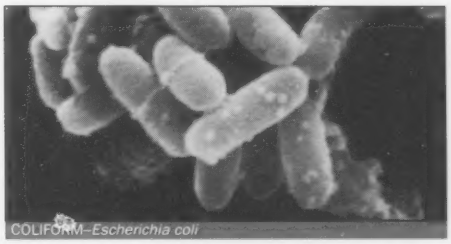


STAPH–*Staphylococcus aureus*



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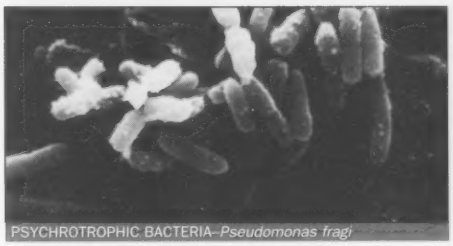

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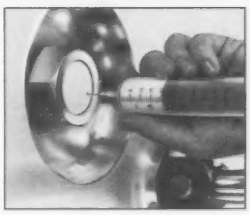

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ABOUT THE COVER . . . *Photo courtesy of Silliker Laboratories Group, Inc., Homewood, IL. Zubair Kirmani, chemistry supervisor at Silliker's IL facility, checks the Vitamin D content in a milk sample using the HPLC method.*

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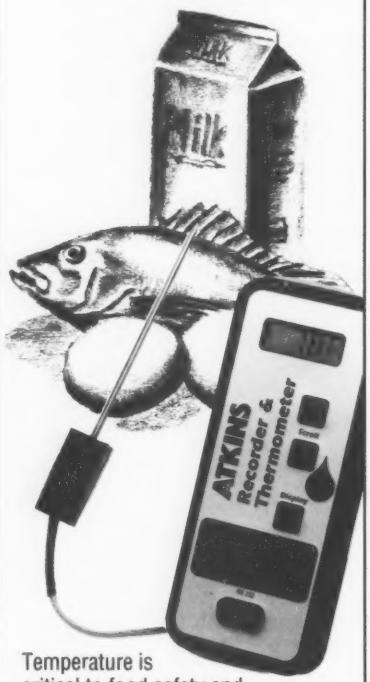

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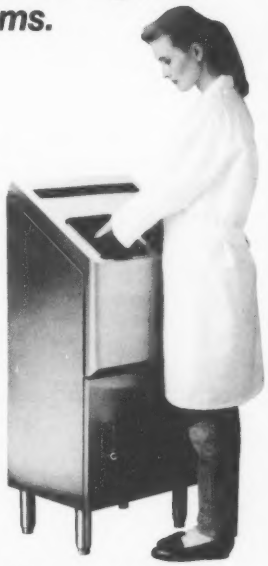

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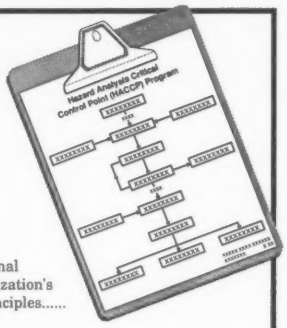

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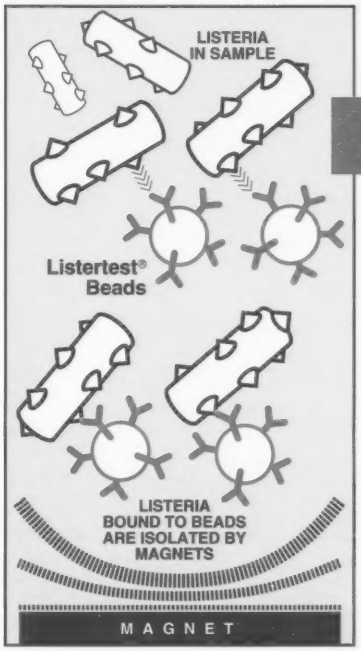

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Thoughts From the President . . .

By
Harold Bengsch
IAMFES President

Strategic Planning Moves Forward

The IAMFES Strategic Planning Session in August of 1993 set four priority objectives for the organization and identified a number of strategies for achieving each of these objectives. It was not possible, because of time constraints, to write action plans during that session, so action planning was assigned to four subcommittees. After further discussion it was decided that this process could be made more effective by an action planning session involving a consultant and staff. Consequently on October 19, 1993 an action planning session was held at the IAMFES offices. At its November 8 and 9 meeting, your executive board approved and implemented the next phase of the long-range plan.

This month's column is an attempt to provide you with a consolidated overview of the action planning now assigned to four subcommittees.

OBJECTIVE "A"
A Major Effort to Expand the Membership

Strategy A1: Expand the focus beyond the current affiliate organizations to identify other potential member pools.

- **Project A1a**: Identify publications and other sources of names who are likely to have members and/or subscribers to whom IAMFES membership may be attractive.
- **Project A1b**: Identify groups with similar interests who exist outside the US whose members may benefit from IAMFES membership.
- **Project A1c**: Develop recruiting materials and a full recruitment program to attract targeted individuals.
- **Project A1d**: Improve the current membership retention program.

Strategy A2: Shift responsibility for developing the membership program from the membership committee to staff.

- **Project A2a**: Redefine the role and charge of the membership committee as an information and resource provider and a group to guide volunteer execution of the program developed under Strategy A1.
- **Project A2b**: Design the membership recruitment program jobs so that they are in small, doable pieces and develop training so that volunteers are able to do effective recruiting.
- **Project A2c**: Develop a program for ongoing evaluation of the membership recruitment and retention activities.

Strategy A3: Develop an effective membership database.

- **Project A3a**: Redesign the membership renewal form so it shows current information for database.
- **Project A3b**: Include the form developed under A3a in the new member data package.
- **Project A3c**: Include a postage-paid self-addressed card in annual directory.
- **Project A3d**: With database in place quantify retention and nonrenewable rates and patterns.

OBJECTIVE "B"
A Major Education Program Development Effort

Strategy B1: Develop a speaker's bureau/panel of experts which can deliver education through the affiliate organizations.
- **Project B1a**: Collect information from all affiliate organizations regarding their speakers and programs.
- **Project B1b**: Create a master list of subject matter, speakers, and programs which can be sent on request.
- **Project B1c**: Promote the availability of the speaker's bureau.
- **Project B1d**: Track the usage of the speaker's bureau panel of experts for year-end evaluation.
- **Project B1e**: Identify areas where the officers of the organizations have expertise and can serve as spokesman to the press.

Strategy B2: Utilize the PDG groups as developers of new programs.
- **Project B2a**: Write a charge for all PDG groups.
- **Project B2b**: Each PDG group to suggest specific programs to the program development committee.
- **Project B2c**: The PAC is to perform a marketing evaluation for each proposed program.
- **Project B2d**: The PAC recommends program content to the board for action and inclusion in the program.

Strategy B3: Develop a process whereby IAMFES creates white papers on issues of significance in food safety and sanitation each year.
- **Project B3a**: Appoint a "White Paper Development Group" with specific charges.

Strategy B4: Develop a system in the office to track all requests for information/program assistance/white papers/and other kinds of requests.
- **Project B4a**: An informational log will be developed to include subject material of request and disposition.
- **Project B4b**: Identify officers as policy spokespeople for the association to whom information requests can be referred.
- **Project B4c**: Identify and approve a list of speakers which the office can recommend when requests are received.

OBJECTIVE "C"
A Major Review of our Current Product and Service Offerings Leading to a Product Enhancement Program

Strategy C1: Write a journal editorial policy.
- **Project C1a**: Staff editor and volunteer editor to write guidelines which now exist informally on editorial policy.
- **Project C1b:** Review editorial policy and approve/revise as necessary.

Strategy C2: Base future education program development on formal research to define program content. See Strategy B2.
- **Project C2a**: Develop a request for a proposal for a research organization to perform regular research for education program content.
- **Project C2b**: Actually perform the research as outlined in the strategic plan.
- **Project C2c**: Use research to guide program development.

Strategy C3: Develop marketing plans for major projects and service areas.
- **Project C3a**: Write formal marketing plans in the area of membership development, educational programs, and publications.

OBJECTIVE "D"
Develop a Formal and More Sophisticated Financial Plan

Strategy D1: Include investment policy, review of dues policy, identification of reserve target, and policy regarding all revenue and expense streams to the association.
- **Project D1a**: Write a preliminary plan documenting all assumptions for review by the board.
- **Project D1b**: Allocate resources according to the financial plan and require performance from all aspects of the organization in accordance with the plan.

Well, there you have it. Ambitious? Yes! Impossible? No! This is indeed a major undertaking but nevertheless a project necessary for the IAMFES to be the Food Protection and Environmental Sanitation leader for the rest of this decade and as we move into the 20th Century. Until next month . . . Happy Holidays.

On My Mind . . .

By
Steven K. Halstead, CAE
IAMFES
Executive Manager

. . . is 1993

Unforgettable hardly does justice to 1993. As Charles Dickens said: "It was the best of times. It was the worst of times." When 1993 was good, it was very good. When it was bad, it was horrible. I would like to review some of the events of 1993--the good and the bad.

1993 was the year in which we saw great gains in our understanding of who we are as an association and role we are to fill in the world. We saw this in our volunteer leadership and the commitment and dedication that they brought to the association. We saw it in the growth of activities undertaken by our Committees, Professional Development Groups and Task Forces. We saw it in the progress made by the Strategic Long Range Planning Task Force as they began mapping our future. We saw it in improvements in our journals both in the quantity and the quality of the information they contained. We saw it in the growth of the membership's demands and expectations from the association.

1993 was the year in which IAMFES took a giant step forward in recognizing that we had outgrown our need for a "bookkeeper" and now needed a Financial Manager if we were to be able to meet our financial information needs. David Tharp's knowledge and expertise have already benefitted us greatly and will continue to allow us to improve our management of the association's finances in ways that would have never been possible with a bookkeeper. It is exciting to be pushed by the visions of what IAMFES can become.

1993 was the year in which we put together the annual meeting while enduring the ravishes of The Flood of the Millennia. Doing that took a toll that I am not sure I fully understood even yet. At the time, it seemed like that the strain was all physical. It was not until I became chocked with emotion as I tried to deliver my report at the Business Meeting, that I began to realize the magnitude of the emotional stress we had been under. As I stood at the podium, I suddenly felt as if a tremendous burden had been lifted from me and I was quite frankly not prepared to handle it. The bright side of that disaster was that we saw a great team effort by a staff that put their comforts and needs secondary to their desire to run a great meeting for you.

1993 was the year in which I saw the best Annual Meeting that I have been involved with in my years of association management. I am still just overwhelmed when I read through the abstracts of the papers presented. Words cannot express the quality of that program. And the ILSI sponsored symposia were the icing on the cake. They pushed a great program way over into the superb program category. But in addition to the program, the social events were outstanding in every way; the hotel was outstanding and our hosts, the Georgia affiliate, was outstanding in every way.

The dark side of this was a dramatic increase in the number of complaints we received from members who were unable to attend all the sessions they wanted to because they could not be in two places at the same time. Never before have we been able to run four concurrent sessions. When you do that, it is natural to find conflicting programming. But then, that is a problem I can live with.

Yes, 1993 was unforgettable. And I just realized that it is impossible to do it justice with one page of words. To paraphrase Shakespeare "The old year is dead--long live the new one!"

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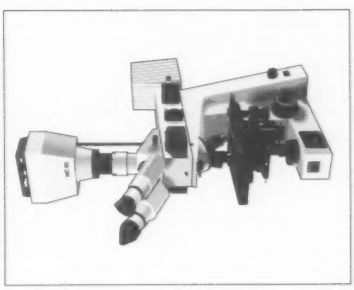

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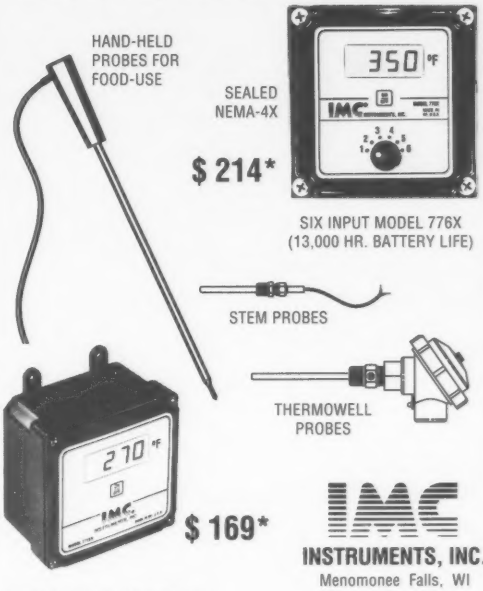

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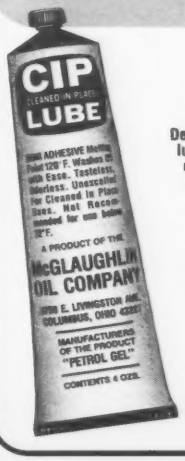

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Foodborne Illness (Part 2)

Salmonellosis

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Salmonellosis is fairly common. Many species and types (called serotypes) of salmonellae are known, over 2300, with all considered pathogenic for humans; some strains are more virulent than others. These bacteria are gram-negative, non-spore forming rods and can grow facultatively, meaning with or without oxygen. They can grow between 41 F (5 C) and 114 F (45.6 C), with the organism being able to double its growth every 25 minutes at about human body temperature, 95 F (35 C) - 98.6 F (37 C). They grow at a water activity range of 0.945 - 0.999; they will generally die off at a pH below 4. The organism can survive freezing.

Salmonella are found in the intestinal tract of animals and humans, with cycles of infection between animals, humans and the environment. Animal food products - meats, poultry, eggs and items made with them - may contain the bacteria; any contaminated foods rich in protein and carbohydrates are particular vulnerable. Sometimes humans (especially as carriers) can be directly or indirectly a source of contamination, with poor handwashing (personal hygiene) playing a vital role in transmission from a human.

Foods that have been implicated with salmonellosis include poultry and poultry salads, meat and meat products, dairy products, egg products, and other protein foods. The prevalence of the bacteria in foods is variable. Studies have shown that about half of chicken carcasses are contaminated with salmonellae, with pig carcasses having lesser contamination, and beef and lamb carcasses having the least contamination. Vegetables, salads, and cereals can be contaminated with salmonellae but at much lower levels than meats. Most vulnerable foods are those handled extensively, left unrefrigerated for periods of time, and then lightly cooked or served without further cooking.

Persons differ in susceptibility to this illness. The incubation period ranges from 6 - 72 hours, with 12 - 36 hours being average; duration of the illness is usually 1 - 4 days. Symptoms are those of acute gastroenteritis, including abdominal pain, diarrhea, and usually nausea, vomiting, a moderate fever, and headache; recovery is usually uncomplicated, but may be more severe in the very young, the elderly, and immunocompromised persons. After an outbreak laboratory studies of any incriminated leftovers and the patient's stools should be done to try to isolate a *Salmonella* serotype.

Salmonella problems from shell eggs emerged during the 1980's. In 1990 FDA again declared shell eggs a potentially hazardous food, making them subject to time/temperature controls. Epidemiological studies have indicated that most outbreaks that occurred in this time frame appear to be related to pooling (commingling) of eggs, temperature abuse, and incomplete cooking (egg mixture runny); FDA has issued egg handling/preparation guidelines.

Control of Salmonellosis

Control (prevention) of salmonellosis is based on four principles which can be accomplished by food service personnel:

1. Cooking (reheating) foods thoroughly and serving them HOT (above 140 F [60 C]) and not just WARM.
2. Preventing recontamination (cross-contamination) by using sanitary practices of food protection and sanitation (cleanliness, especially of the hands and food-contact surfaces, and proper use of equipment, utensils [are knives cleaned and sanitized between uses ?], and dishware).
3. Prompt cooling (freezing) of foods after preparation (if prepared ahead) to retard multiplication of bacteria, especially by storing in shallow pans (food not over 4 inches in depth) or in small quantities or portions. Do not store foods at room temperature.
4. *Complete reheating* (to at least 165 F [74 C]) of stored refrigerated foods in or on proper heating units, not by using warming (holding) units.

Remember, foods contaminated with salmonella bacteria do not usually appear to be "bad" (spoiled), so that changes in odor and taste are not apparent.

Salmonellae + food safety mistakes can = ILLNESS.

Part three of the Foodborne Illness Series will be published in the January, 1994 issue of Dairy, Food and Environmental Sanitation.

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Recovery of Short Chain-Length Fatty Acids from Milk by Several Methods

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ABSTRACT

Hydrolytic rancidity is a potential flavor problem in milk. Traditional means of measuring rancidity do not correlate well with flavor scores. The copper soap method, an extraction-titration method, and analyses by gas chromatography were compared for ability to recover butryric, caproic, caprylic, capric, and lauric acids from milk. The copper soap method did not recover the shortest chain-length fatty acids but the other two methods did. The extraction-titration procedure was used to analyze commercial milk samples. Mean free fatty acid content was 0.61 μeq/mL (+ 0.31 μeq/mL). Duplicate samples varied with an average of 0.06 μeq/mL. The average coefficient of variation on the duplicates was 9.5%.

INTRODUCTION

Milk readily develops lipolyzed off-flavor; a result of enzymatic hydrolysis of fatty acids from the glycerol molecule resulting in free fatty acids (FFA), mono- and diglycerides. Even chain-length FFA of 12 carbons or less have been reported to impact specific flavor sensations variously described as like butyric acid, cowy, unclean, goaty, bitter, soapy, and rancid (1). FFA of greater than 14 carbons in length have not been reported to contribute to the flavor described as rancid or more correctly lipolyzed. Only minimal quantities of short chain-length FFA are required for detection by sensitive individuals. The enzyme, lipase, responsible for hydrolysis of FFA from milk fat is found normally in raw milk but is inactivated by adequate pasteurization. In raw milk, the milk fat is protected from attack by the enzyme by milk fat globule membrane. Improper handling of raw milk can disrupt the protective membrane allowing lipase to cause rancidity. Excessive agitation, freezing or churning, or mixing of raw and homogenized milk are common ways for rancidity to result.

Traditionally, acid degree value (ADV) has been used as a measure of hydrolytic rancidity. The most recent edition of *Standard Methods for the Examination of Dairy Products* (15) recognizes the limitations of ADV and now specifies that high ADV results are indicative of hydrolysis of milk fat rather than assurance of rancid flavor development. Research in our laboratory has shown that ADV is not a good measure of rancid flavor development since it does not detect the short chain-length FFA responsible for the flavor (10,11,12). In an International Dairy Federation monograph (2) the limitations of ADV (also known as BDI) are discussed. They suggest that the "copper soap" method described by Koops and Klomp in 1977 and modified by Shipe et al. in 1980, has advantages over ADV of rapidity and potential for automation. The monograph authors comment that it does not appear that the accuracy of the copper soap method in recovering specific short chain-length FFA has been assessed. The monograph also describes an automated method based on the method of Dole and Meinertz (9) that had previously been applied to blood plasma. The three methods described in the IDF monograph were for rapid laboratory analyses of multiple samples.

We have adapted the methods of Dole (8), Noble (16), and Dole and Meinertz (9) to a simple extraction-titration procedure (4). The objective of this research was to compare the recovery from milk of short chain-length FFA by the copper soap method, the modified extraction-titration method developed in our laboratory, and a gas chromatography method of Deeth et al. (7). Further, the results of using the extraction-titration procedure on commercial samples of milk are reported.

MATERIALS AND METHODS

Recovery of FFA from Milk

Samples were prepared by adding 0.6 g of Tween 80 to each sample bottle with or without (blank) weighed quantity of fatty acids. Fatty acids used were butyric (4:0), caproic (6:0), caprylic (8:0), capric (10:0), and lauric (12:0). All fatty acids were from Sigma (St. Louis, MO). Quantity of each fatty acid was determined to the nearest 0.0001 g and was approximately 0.5 μeq/mL. Fatty acids and Tween 80 were transferred to a blender jar containing 500 ml of commercially-pasteurized, homogenized whole milk (the sample bottle was rinsed 5× with milk to ensure complete transfer of fatty acids) and mixed at low speed (Waring Products, New Hartford, CT) for 3 min.

To avoid contamination, all glassware were soaked in a solution of saturated alcoholic KOH; washed with detergent and rinsed several times with deionized, distilled water; rinsed with 4% acetic acid; rinsed with deionized, distilled water; and oven-dried.

---

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Copper Soap Procedure

The copper soap extraction method was as described by Shipe et al. (18) except that the solvent was a 48:48:4 (v/v/v) mixture of chloroform/heptane/methanol. Standard curves were prepared using palmitic acid. Recoveries were calculated as percent of quantity of fatty acid added.

Extraction - Titration Procedure

The titration method for determining the extent of lipolysis was developed by Christen and Shen (4) as a modification of the methods of Dole (8) and Noble (16). FFA were extracted using a mixture of isopropyl alcohol, hexane and 0.1*N*sulfuric acid in a ratio of 40:10:1 (v/v/v). The extraction mixture (15 mL) was added to 5 mL of milk sample in a 25 × 150 mm culture tube, with a Teflon™-lined screw cap. After mixing for 15 s using a Vortex mixer (American Scientific Products, McGraw Park, IL), hexane (16.5 mL) and water (6 mL) were added. All reagents were added from repeating burette dispensers fitted atop amber reagent jars. The test tubes were placed horizontally in a basket and were shaken for 15 min using a Garver shaker (Garver Mfg. Co., Union City, IN) at full speed. Tubes were placed upright and the layers allowed to separate. The upper layer was transferred into a 50 mL beaker placed on a magnetic stirrer. KOH (0.001 *N* in 95% ethanol) was added from a 50 mL burette to a pH endpoint of 11.30. A Ag/AgCI glass body combination electrode (Fisher Scientific, Atlanta) designed for use in nonaqueous solutions was used to monitor pH. The electrode was connected to an Orion Research Digital lonalyzer, Model 501 (Orion Research Inc., Boston, MA) with accuracy of 0.01 pH units. Lauric acid was used to standardize the KOH. One-half milliliter 0.005N lauric acid in hexane was added to 4.5 mL water and extraction was performed as for the samples. A blank consisted of 0.5 mL hexane and 4.5 mL water and was extracted as for the samples. Recoveries were calculated as percentage of quantity of fatty acid added.

Gas-Liquid Chromatographic (GLC) Method

FFA were extracted from the samples according to the procedure described by Deeth et al. (7). Modifications of the method included the conditioning of alumina at 173°C for 24 h prior to extraction. Also, pentanoic acid was used as the only internal standard and was added into the formic acid-diisopropyl ether (6%, v/v). Details of the gas chromatographic method may be found in Lee (14). Purity of the standards was determined by injecting a dilution of each standard onto the gas chromatograph column. Purity was determined by dividing the area of the standard by the total area.

Extraction-Titration Procedure on Retail Milk Samples

Forty-six samples of pasteurized-homogenized whole milk were randomly purchased from retail stores in the Knoxville, TN area. These were in paperboard or pigmented plastic containers (1 pt, 1 qt, 1/2 gal, or 1 gal). Code dates showed samples were of varying age. All samples were held at 4°C until evaluated and duplicate analyses were complete on each. Microequivalent (μeq) of FFA per milliliter of milk was determined using equation 1.

$$\frac{\mu eq\ FFA}{mL\ milk} = \frac{A \times B \times 1000}{sample\ size\ (mL)} \qquad \text{Eq. 1}$$

Where:
A = volume of KOH added for the sample minus the volume of KOH added for the blank;
B = normality of KOH as determined by standardization using lauric acid.

RESULTS AND DISCUSSION

Recoveries of butyric, caproic, caprylic, capric, and lauric acids from milk by each of the methods are given in Table 1. Recoveries by ADV as reported by Duncan and Christen (11) are provided for comparison. The copper soap method does not recover butyric or caproic acid. This was as expected; although previously, the lack of recovery of these fatty acids had not been verified (2) . The copper soap method recovers capric and lauric acid efficiently. In contrast, the other two methods evaluated in this research did not recover capric or lauric acid very well, but did recover the shorter chain-length fatty acids. Best recovery of these shorter chain-length fatty acids was by the gas chromatographic method of Deeth et al. (18). This method, however, is tedious and does not lend itself to routine quality assurance applications. Although the extraction-titration procedure does not recover completely the short chain-length fatty acids, it does recover them partially. The standard deviations reported reflect difference between determinations an different samples of milk. Homogenization of milk may interfere with complete extraction of FFA (2). Although great care was taken to replicate exactly the procedure, it is possible that the blending process varied enough to introduce the variation reported herein.

The copper soap method is not recommended for use on homogenized milk because of lack of correlation with ADV (18). It has been postulated that this lack of correlation is due to incomplete extraction of the FFA from the fat in homogenized milk (2). Our results indicate that the copper soap method better recovers medium chain-length FFA from homogenized milk than does ADV. This may account for the

Table 1. Recovery of individual fatty acids by four different methods and purity of the standards determined by gas chromatography.

Fatty Acid	Acid Degree Value[a] (n=4)	Mean Percent Recovery by Each Method (± standard deviation) Copper Soap Method (n=8)	Extraction-Titration Methods (n=6)	Method of Deeth et al. (GC[b]) (n=2)	Purity of Standards (% by GC)
Butyric (4:0)	9.1	0.0 ±0.0	50.0 ±6.6	99.6 ±4.8	96.0
Caproic (6:0)	7.1	1.4 ±14.2	64.1 ±12.1	118.7 ±36.1	96.6
Caprylic (8:0)	8.0	53.4 ±10.4	85.5 ±17.4	94.4 ±3.8	97.1
Capic (10:0)	30.0	120.0 ±19.8	45.8 ±13.2	33.2 ±9.7	98.9
Lauric (12:0)	32.3	107.8 ±15.4	42.6 ±23.8	33.5 ±17.4	96.2

[a]From Duncan and Christen (1991)
[b]gas chromatography

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lack of correlation between the methods, and the copper soap method may in fact be a better method for homogenized milk. Shen (17) reported that recovery by the copper soap method of fatty acids with 14, 16, and 18 carbons was similar to recovery by ADV.

Post-manufacture lipolysis by heat-resistant lipases originating from psychrotrophic bacteria is the primary risk for lipolytic off-flavors in milk and milk products currently (2). Although data is limited, bacterial lipases may preferentially release short and medium chain-length fatty acids that affect milk and milk product flavor quality (2). Research in our laboratory indicates that lipases from psychrotrophic bacteria release significantly more butyric, caproic, and caprylic than does milk lipase (Breeding, 1989). Methods which are insensitive to the short and medium chain-length FFA may not accurately predict lipolytic flavor resulting from heat-resistant bacterial lipases. The extraction-titration procedure reported herein deserves further evaluation for this application. Subsequent research in our laboratory indicates that the method is better correlated with lipolytic flavor of milk than is ADV (5,14). Further, 15-min shaking can be replaced by a simple manual inversion, and the titration can be automatically completed using an auto-titrator (unpublished data).

Application of the extraction-titration procedure to 46 samples of milk obtained from retail stores and held under various conditions yielded a mean FFA content of 0.61 µeq FFA/mL (+0.31 µeq FFA/mL). The maximum value for these samples was 1.28 µeq FFA/mL and the minimum was 0. Deeth and Fitz-Gerald (6) reported that normal raw milk from a healthy cow is expected to have a FFA value of 0.5 µeq/mL while milk with 2.0 or more µeq FFA/mL will likely have a lipolyzed flavor. The retail samples also were analyzed by a sensory panel trained to evaluate lipolyzed flavor in milk (14). The overall mean lipolyzed flavor score was 1.4 on a scale of 0 = not rancid to 15 = rancid. The mean lipolyzed flavor scores ranged from 0 to 4.74 for these samples (14). Thus, the sensory results supported the chemical evaluation.

Duplicate determinations on the same sample varied from one another by an average of 0.06 µeq FFA/mL. The average coefficient of variation for the duplicates was 9.5%.

ACKNOWLEDGMENTS

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The Use of Conductivity for Controlling Cleaning Solution Strength

Gerald Harsma,
West Agro, Inc., 1110 North Congress Avenue, Kansas City, MO 641533

WHAT IS CONDUCTIVITY CONTROL?

For our purposes conductivity control refers to a device that measures the electrical conductivity of a chemical solution. This device will start or stop a chemical feed pump or an alarm in response to the measured conductivity value of the solution being controlled.

WHAT DOES CONDUCTIVITY MEAN?

Conductance is defined as the reciprocal of electrical resistance as measured between the probe leads when the probe is immersed in the chemical solution to be measured. Conductivity is the measured value of conductance between two opposing faces of a cube of solution one centimeter on a side. Conductivity depends only on the solution being measured. The electrical resistance value is measured in Ohm's. Since conductance is the reciprocal of resistance the word Ohm is simply reversed. The conductance measurement is named mho. One mho is equal to 1,000,000 micromho's. The metric equivalent of the mho is the Sieman. 1,000,000 micromho's are equal to 1,000 millisieman's.

WHY DO WE USE CONDUCTIVITY TO CONTROL SOLUTION STRENGTHS?

Conductivity controllers and meters can be had in a great variety of capabilities and price ranges. The very simplest devices are priced in the two to three hundred dollar range. These are the devices you will most commonly see used in our industry. The capabilities of this type of unit are very limited. They will typically have one electrical contact to control a pump and an alarm of some sort built in. They are also usually a "blind" instrument in that all that is indicated is that the reading is above and below the set point. The more complex units will have more capabilities. The complex units usually have a temperature compensating control built into them. They will also have two or more output contacts, a 4 to 20 milliamp output for both temperature and conductivity, and a digital read out. The output contacts usually have individually adjustable set points. A charging timer is also usually included in the complex units. There are also conductivity controllers available that are known as non contact devices. These do not use a probe that is directly exposed to the solution being measured. This class of conductivity controllers can be priced up to a thousand dollars or more. From this you can see that there is a device available for any type of installation required. These units are all more or less accurate controlling devices provided the selection of both the device and the sensing probe was properly carried out. The bottom line is that a conductivity control can be obtained to accurately control chemical solution strength and to provide other desired functions at a reasonable cost. The alternatives to conductivity controls are for the most part not as accurate or more expensive.

WHAT ARE THE FAULTS OF CONDUCTIVITY CONTROLLERS?

The conductivity of all chemical solutions is affected by temperature. The conductivity will increase by 1.3% to 2% per degree of temperature increase. This will vary with the chemical solution being measured. This means that if the solution is made up by a conductivity control with cold water the solution strength will be too strong at use temperature. This assumes that the conductivity control being used does not have a temperature compensation feature. If the control being used does have a temperature compensation feature it can only correctly compensate for the temperature curve of the specific chemical for which it is set. Should a second chemical with a different temperature curve be controlled by the same controller there would be an inherent error introduced into the control of the second chemical.

The probe used with any chemical must obviously be suited to the chemical, both in chemical resistance and in conductivity characteristics. Chemical resistance is not that much of a problem in the age of plastics. The conductivity characteristics, even if correct at installation, can vary by the probe becoming soiled or plated. This means that the probe must be inspected frequently and cleaned when necessary. The chemical solution should also be titrated with the correct test kit at regular intervals to assure that the controller is accurate.

Water hardness also affects conductivity control in that the hardness present in the water will impart a conductivity value to the water. If this is not taken into account when setting the controller an error is always present in the solution strength. It is advisable to make periodic checks of the water hardness present in any installation and then make any needed adjustment to the conductivity control setting. Product soil has an effect on the conductivity of a chemical solution. By way of illustrating these points the following tests were run; water used to mix solutions used in these tests were tap water with 300 ppm total hardness and distilled water.

These tests were not run under laboratory conditions and were done with a rather crude conductivity device. And yet, these tests still proved accurate, with the results being repeat-

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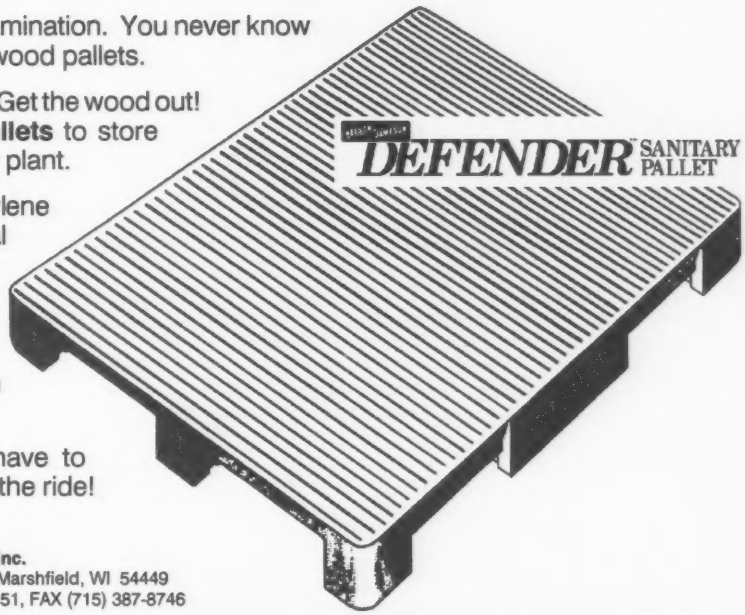

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Conductivity of water	0 mmho's
Conductivity of distilled water and Chlor-Mate HW	3300 mmho's
Conductivity of solution soiled with 1 oz/gal of 2% milk	3450 mmho's

Test 2 - 1/2 oz Chlor-Mate HW in 1 gal. tap water.

Conductivity of water	300 mmho's
Conductivity of tap water and Chlor-Mate HW	3650 mmho's
Conductivity of solution soiled with 1 oz/gal of 2% milk	3800 mmho's

Test 3 - equivalent of 1 qt acid 2000 in 100 gal. of distilled water

Conductivity of water	0 mmho's
Conductivity of distilled water and acid 2000	6500 mmho's
Conductivity of solution soiled with 1 oz/gal of 2% milk	6300 mmho's

Test 4 - equivalent of 1 qt acid 2000 in 100 gal. of tap water

Conductivity of water	300 mmho's
Conductivity of tap water and acid 2000	7500 mmho's
Conductivity of solution soiled with 1 oz/gal of 2% milk	7300 mmho's

able. Each test was run twice with a fresh mixture of solution each time with the same results.

There is a definite link between water hardness, the soil load of the solution, and the conductivity of a chemical solution. This interrelationship can vary depending on the chemical and soils. Notice the reduction in conductivity of the acid 2000 solution when the 1 oz/gal. of 2% milk was added. This is the opposite of what was observed in the Chlor-Mate HW solutions.

PROBE SELECTION

When selecting the probe for use with a specific product it should be kept in mind that the selection must be based on the properties of the chemical and the characteristics of the conductivity device to be used. The material of the probe housing and of the sensing elements must be of a material that is compatible with the chemical properties of the product. The sensing elements must be suited to the conductivity range of both the product and the conductivity device. You must also keep in mind the expected temperature range that the probe will be required to operate in.

The manufacturer's specification charts will help you to make the proper selection. Most of the specifications are of a straight forward nature, like the section marked as cell constant. For a product with a very high conductivity value select a probe with a higher cell constant or "C". In general, a cell of 5 to 10 is normal for our business. For products having a very low conductivity value, select a probe with a lower cell constant. The probe should also be selected to provide a conductivity reading in the mid range of the conductivity device being used. This will assure more accurate results.

EXAMPLE

If a chemical solution produces a conductivity reading of 10,000 mmho's with a probe having a cell constant of 10, the same solution will produce a reading of 20,000 mmho's from a probe having a cell constant of 5.

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Biological Effects of 137C Uptake in Carp (*Cyprinus carpio, L.*) and Eel (*Anguilla anguilla, L.*): A Comparative Study

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Abstract

Comparative studies were carried out in two cultured freshwater fish, Cyprinus carpio and *Anguilla anguilla*, to determine their tolerance in the uptake of 137Cs (3000 Bq/l). The results showed that the concentration of 137Cs in the muscular tissues was greater in the carp and lesser in the eel. The accumulation was progressive for both species and for a period of six months.

The histological studies were concentrated in muscular tissues, livers, kidneys, and gills. The symptoms observed include hyperaemia, and gradual degeneration of liver and kidney tissues. The physiology and anatomy of each species played an important role in the accumulation process of 137Cs.

Introduction

Prior to 1945 x-rays and radium, mainly used for medicinal treatment, constituted the only important radiation hazard to man. With the subsequent vastly expanded use of radioactive material, primarily for military purposes and industry, not only has the potential radiation danger increased many times but so has the danger from fallout. Oceans covering large proportions of the earth, naturally are the major recipients of man-induced stratospheric and atmospheric radio elements. It therefore, seems appropriate to survey to what degree such radioactive matter can enter the aquatic food harvests and if they influence in any detrimental way the normal productivity of the oceans (1).

Food is a major route by which environmental radiocontaminants reach man (2,15). Even with strict controls and containment, releases of radioactive fission products from nuclear plants are likely to occur (12). Animal products may become contaminated basically in two ways, directly or indirectly. Directly, through drinking water, inhalation or originating from aquatic organisms via gills and integument. Indirectly, through consuming contaminated food. Various aquatic organisms are capable of taking up radionuclides but unfortunately accumulate considerable quantities of such nuclides in their organs (13).

Cesium-137 was selected for this study due to its abundance in fission products, its relatively long half-life as radionuclide and its facile incorporation into food, body fluids and tissues (7,14). It is regarded as the fission product with greatest potential hazard. Recently a number of accidents in nuclear stations revealed the possibility of radioactive substances accumulated in fish (3,4,11).

Cyprinus carpio and *Anguilla anguilla* were selected for this study, due to their different anatomy and physiological function. In addition carp is a bottom feeder while the eel ranges throughout the water (5).

This work is concerned, with the accumulation of 137Cs in two known species and its pathological effects, for comparative purposes. The results of this investigation can aid in finding the relative sensitivity of aquatic organisms to 137Cs and in planning emergency actions following accidental releases of nuclear fission products with subsequent contamination of marine biota (6).

Analytical methods

The determination of 137Cs was done by gamma-spectroscopy system, consisting of a high purity coaxial Germanium detector p-type (CP 2100 Tennelec). The sample chamber was a cylinder 2cm in diameter and 25cm in height and was shielded by 5.0cm of lead and 0.5cm of copper. The full width at half maximum (FWHM) of the system was found to be 1.95 Kev at 1332 Kev of 60Co. The linearity of the detector was checked with a 152Eu source and a simple regression analysis gave a straight line with a correlation coefficient of 0.999. The radionuclides used were supplied by "The Nucleus", Oak Ridge, U.S.A. The experiment was conducted in fresh-water fish *A. anguilla* and *C. carpio* cultured in small water tanks, artificially contaminated with radioactive 137Cs. The fish *A. anguilla*, were collected from artificial ponds two days before the experiment started. The fish *C. carpio* were collected from a local

lake. They were kept in a 200L aquarium provided with good aeration and continuous throughflow on tap water, dechlorinated by active carbon. The fish acclimatised well to the aquarium conditions, behave normally and no diseases occurred. The dimensions of the water tanks used were 79cm in length, 35cm in width and 50cm in height.

The fish were sacrificed every one or two weeks, weighed, their length was measured and the overall condition of the fish was compared with the control. Visual observations were recorded and the radioactivity of a few organs was measured. The samples of the organs were fixed with 10 percent formaldehyde solution, embedded in paraffin wax and sections of 3-10μm thickness stained with Erlich's hematoxylin-eosin, to be examined under the microscope.

Results and Discussion

No changes visual or microscopic were noticed in the control fish. Behavioural changes were not observed. Both species kept their balance and respiration was normal. The results indicated that the amount of 137Cs was more in the muscular tissues of carp than the eel. As Table 1 shows, the accumulation for the eel was progressive for a period of two months. After that time the load of 137Cs seems to be stabilized. The slime which is destroyed in the presence of salt is removed in one percent solution of ammonia (9), it may play a protective role against the absorption of 137Cs from the skin. The secretions of mucous membranes have important protective and lubricative functions. Their active substances are glycoproteins, known as mucins, that contain numerous negatively charged oligosaccharide chains (8,10).

Eels are smooth skinned and very slimy. Most people would say that an eel has no scales, but actually many very small scales are present but they are embedded under the skin. Due to the absence of large scales, an eel can breathe through its skin as well as through the gills. The proportion of breathing carried out through the gills is about 40 percent and that through the skin is about 60 percent. This means that less water is taken up by the eel in comparison to carp (9). Higher amounts of 137Cs were found in carp and the accumulation was related to the time of exposure.

The polyelectrolytic behavior of slime, together with the rate of respiration and the different compositional characteristics of the fish organs, can explain the difference in accumulation of 137Cs in both species. The histological studies revealed that eel is more resistant to 137Cs exposure than carp. The presence of 137Cs in all organs tested caused a gradual degeneration. With high doses up to 3000 Bq/l degeneration of epithelial cells and secondly fusion of lamellae final in the gills are very common. It is concluded that allergic or toxic effects of 137Cs caused liver hyperaemia, hemorrhages in musculature fibers and focal degeneration of epithelial cells of the renal tubules.

Table 1. Uptake of 137Cs in cultured fresh-water fish: *Cyprinus carpio* and *Anguilla anguilla*.

Time of killing (days)	Concentration of 137Cs (Bq/Kg) in muscular tissue		
	Carp		Eel
	(1500 Bq/l)	(3000 Bq/l)	(3000 Bq/l)
15	980	1150	1170
30	2980	6437	1000
45	3550	8023	2500
60	---	10460	4000
90	4985	12141	4400
120	10850	18959	4900

Conclusions

The presence of 137Cs causes allergic and toxic effects. The ability of both species to concentrate 137Cs to a high degree make them valuable as biological indicators of radioactivity. The present work intensifies the necessity to look after more aquatic species investigating their sensitivity to 137Cs in order to plan an emergency action, in case of a nuclear accident and subsequent release of radionuclides in the environment. More work has to be done on the uptake of 137Cs, governed chiefly by physical factors, such as pH, ion exchange, concentration differentials, etc., besides the accumulation, due to normal physiological activities in animals.

ACKNOWLEDGMENT

The authors wish to express their appreciation to Mrs. H. Diomou and Mr. D. Tzelepidis from the staff of Applied Physics Lab. and to the following students for their collaboration and assistance in conducting the research: H. Karagianis, G. Ioannidis, S. Iakovoglou, Ch. Tsileepidis, S. Theoharis and J. Ioannidis.

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News

Dairy Leaders Develop Plan for Farm Financing Demonstration

Demonstrating the financing of dairy farms that will provide a "sustainable lifestyle" for milk producers is the goal of a new plan that Minnesota dairy leaders have developed.

The plan provides for 20 demonstration farms across Minnesota to receive financing beyond normal operating limits. Backing for the extra financing would come from guarantees made by milk processors and other dairy-related businesses.

The plan was drafted by a subcommittee of the Minnesota Dairy Leaders Roundtable, which includes some 50 top dairy leaders in the state. Dave Eckholm of Land O' Lakes and John Fetrow of the University of Minnesota's College of Veterinary Medicine were co-chairs of the subcommittee. Fetrow outlined the plan at a recent Roundtable meeting.

"Over the past seven years, Minnesota has lost nearly a third of it's dairy farms, 22 percent of its cows, and has fallen from fourth to fifth place as a major dairy state," said Fetrow. "Despite these drops, dairying accounts for 20 percent of all farm income in the state."

"If there are no farms, there are no cows and no milk," Fetrow continued. "If there is no milk, the are no feed sales, no manufacturing jobs, no local employment, and no service (over) industries to support the remaining dairy farms."

Fetrow said Minnesota has the advantages of low-cost feed, plentiful water and smart farmers. "But," he added, "for many farmers, there is lack of a sustainable lifestyle. Many lack the opportunity to live on a farm in a way that they want to continue there. Young people say 'I have other options in my life I would rather pursue.' It relates to income, working hours, working conditions, the amount of time off. They don't live in a vacuum; they see how other people live."

Fetrow said new farmers and those making gradual changes can usually find sources of financing. It is those who want to make a "major leap forward" who most often have trouble finding financing, he added.

"Typically, they want to combine more than one family together in an operation, so a son can join a father," he said. "They need to expand to an economically efficient scale. They also want to preserve a decent income and sustainable lifestyle for each family.

"These operations may have an excellent background of productive farming, stable finances, and responsible farm business management. However, they may not have enough equity to obtain conventional financing for such an expansion."

The plan Fetrow outlined and the Roundtable endorsed would provide loans beyond normal operating limits for about 20 such farms over the next two years. The Farm Credit System has agreed to be the source of the loans. Borrowers would pay an interest (more) premium on the extra money, and this premium would go into a pool of funds to back the loans. An additional level of backing would come from the guarantees made by the processors and other agri-businesses.

"By making these guarantees, these businesses provide a demonstration and a major stimulus to the state's dairy industry," said Fetrow. "They also support a project that can be replicated by others across the entire state in the future."

For more information contact John Fetrow at (612)625-7791.

Bruce Smith New Sales Manager at Fristam

Fristam Pumps announces that Bruce Smith has joined the company as the Northeast Territory Sales Manager. Bruce will have responsibility for all distributor and OEM sales in northeastern United States and eastern Canada.

Bruce previously worked for Oliver M. Dean, a distributor of process equipment, and held several sales and marketing positions with Anderson Instrument Company. Along with his 15 years of experience in the sanitary process industry, Bruce brings to Fristam a BA degree from Hope College and a Master's degree from Florida State University.

Bruce will be managing the northeast region from his home office in Fultonville, New York, where he lives with his wife and three children.

Fristam Pumps, Middleton, WI, manufactures sanitary centrifugal and positive displacement pumps for the food, dairy, beverage, pharmaceutical, and biotechnology industries.

For more information contact Connie Fricke, Marketing Coordinator at (608)831-5001.

West Agro Acquires Chemland

West Agro, Inc., announced it has acquired most of the assets of Chemland, Inc., including its plant in Turlock, California. Chemland manufactures dairy farm and food processing facility cleaners and sanitizers, as well as udder health products.

West Agro is a member of the worldwide Tetra Laval Group, based in Sweden, which manufactures and distributes equipment and supplies for the dairy, food processing and dairy farm industries. In addition to its manufacturing facility and headquarter operations in Kansas City, Missouri, West Agro operates manufacturing plants in Des Plaines, Illinois; Orrville, Ohio; and Hamilton, New York.

West Agro intends to operate Chemland as a separate entity with its own distinct line of products, services and distribution.

For more information, please call West Agro, Inc., 11100 North Congress Avenue, Kansas City, MO 64153, (816)891-1600.

Retirement

Lloyd A. Doane, 66, of 200 Jordan Drive in West Des Moines retired July 30 as a milk rating officer for the Iowa Department of Public Health. He had been with the department for 19 years. Doane and his wife Sandra, have a son, Brent, of Topeka, KS. He plans to spend time traveling and managing a family farm in Kansas.

In Memory of . . .

Walter F. Laun, Jr.

The Food and Dairy Industry suffered a great loss on Sunday, July 11, 1993. Walter F. Laun, Jr., a 40-year employee of Cherry-Burrell Corp., died at the Mercy Medical Center in Cedar Rapids, Iowa, at the age of 69.

Walt Laun was born on February 11, 1924, in Utica, NY, and obtained a BME from Cornell University, Ithaca, NY. He married Helen Mackay Laun on July 26, 1952, and together they have one daughter, Deborah Mackay Grantham.

Although active with the 3-A Sanitary Standards Symbol Council for many years, Walt became the 3-A Symbol Administrative Officer after his 1989 retirement from Cherry-Burrell. Walt had devoted most of his life to the betterment of the Food and Dairy Industry. In 1992, he received the DFISA Distinguished Service Award, in response to his service and dedication to the industry.

Survivors include his wife, Helen Mackay Laun, his daughter, Deborah Mackay Grantham and her husband, Thomas E. Grantham of Cedar Rapids. A memorial fund has been established.

Vernal S. Packard, Jr.

Vernal S. Packard, Jr., Professor Emeritus and Extension Specialist in Dairy Technology, died of cancer on September 28, 1993. He had been on the faculty of the University of Minnesota for 36 years, retiring from the Department of Food Science and Nutrition on June 30, 1992.

Dr. Packard earned a Ph.D.in Dairy Technology from the University of Minnesota in 1960. As a faculty member, he conducted continuing education programs for dairy and food plant management, production and field personnel, dairy farmers, and the general public. His specialty was milk analysis and quality evaluation: his programs emphasized new and emerging production and processing technologies; analytical and quality control procedures; product composition, wholesomeness, nutrition, and safety; and regulations, standards, and labeling.

He wrote two books and numerous research papers and Extension bulletins. He was a member of the International Association of Milk, Food, and Environmental Sanitarians, American Dairy Science Association (member of the editorial board, Journal of Dairy Science), Institute of Food Technologists, Association of Official Analytical Chemists, Minnesota Sanitarians Association, Minnesota Dairy Science and Technology Association, Sigma Xi, and Gamma Sigma Delta.

Dr. Packard is survived by his wife, Kathryn; two sons—William (and his wife, Patricia) and Stephen; three daughters—Mary (and her husband, Wyman Collier), Susan, and Amy; one grandchild, his mother, and a sister.

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Federal Register

Department of Health and Human Services

Food and Drug Administration

Quality Standards for Foods With No Identity Standards; Bottled Water

Agency: Food and Drug Administration, HHS.

Action: Proposed rule.

Summary: The Food and Drug Administration (FDA) is proposing to amend the quality standard for bottled water to require that bottled water be free of coliform bacteria. This action is in response to a rulemaking by the Environmental Protection Agency (EPA) amending the National Primary Drinking Water Regulation (NPDWR) for coliform bacteria in public drinking water. FDA is also addressing other matters concerning the microbiological quality of bottled water and is requesting comments on whether the agency should establish quality standard regulations for other microorganisms that may be present in bottled water and may pose a health risk.

Background

EPA promulgates NPDWR's to protect the public from the adverse health effects of contaminants in public drinking water. In addition, at the time that it promulgates NPDWR's, EPA promulgates maximum contaminant level goals (MCGL's), which are health goals that are based solely on considerations of protecting the public from the adverse health effects of drinking water contamination.

NPDWR's, which are enforceable standards, consist of either a maximum contaminant level (MCL) or a treatment technique regulation for each contaminant. EPA sets MCL's for contaminants as close as feasible (with the use of the best technology or other means available, taking cost into consideration) to the MCLG, the level at which no known or anticipated adverse health effects occur and that provides an adequate margin of safety. When it is not feasible to establish an MCL for a specific contaminant, EPA can establish a treatment technique requirement for removal or reduction of that contaminant from drinking water to protect the public health from the adverse health effects of that contaminant.

In the **Federal Register** of June 29, 1989 (54 FR 27544), EPA published a final rule amending its NPDWR for coliform bacteria. EPA revised the MCL for total coliform bacteria (total coliforms), including *Escherichia coli* (*E. coli*) and other fecal coliforms, in public drinking water. In addition, it established an MCLG of zero for total coliforms, including *E. coli* and other fecal coliforms. This rulemaking was based upon a proposal that EPA had published in the **Federal Register** of November 3, 1987 (52 FR 42224).

A. MCLG for Total Coliforms

In its November 3, 1987, proposal (52 FR 42224 at 42226) to amend the NPDWR for coliform bacteria in drinking water, EPA stated that public health officials and professionals have used total coliforms for decades as the major criterion to assess the microbiological quality of drinking water. Coliform bacteria are usually present in water contaminated with human or animal feces and are often associated with outbreaks of diseases (Refs. 1 and 2). Moreover, according to EPA, although the presence of coliform bacteria in drinking water indicates that fecal pathogens may also be present, the detection of fecal coliform organisms, in particular *E. coli*, provides more definitive evidence of fecal pollution than the detection of total coliforms.

EPA noted in its November 3, 1987 proposal (54 FR 42224 at 42227) that the data in the available literature do not support a quantitative relationship between coliform densities and either pathogen density or the potential for waterborne disease outbreaks. In its June 29, 1989, final rule (54 FR 27544 at 27548), EPA stated that it was not aware of any data in the literature that support a coliform density value below which there are no anticipated adverse health effects with an adequate margin of safety. EPA further stated that waterborne disease outbreaks and the presence of specific waterborne pathogens have been associated with coliform densities from less than 1 per 100 milliliters (mL) to very high levels. Therefore, to reduce fecal pathogens to minimal levels, EPA established an MCLG of zero for total coliforms in drinking water, including *E. coli* and other fecal coliforms.

B. MCL for Total Coliforms

1. Intent is to Lower Risk of Waterborne Disease Outbreaks

In its final rule of June 29, 1989 (54 FR 27544 at 27547), EPA concluded that despite existing drinking water regulations, the number of actual outbreaks and cases of waterborne disease was unacceptably high. For example, EPA noted that between 1971 and 1983, 427 outbreaks with over 100,000 cases of waterborne disease have been reported. However, because EPA believed that a large number of waterborne disease outbreaks and cases was not reported, it concluded that the actual number of outbreaks was much higher than the recorded number of outbreaks.

EPA, therefore, established several regulatory measures in its final rule of June 29, 1989 (54 FR 27544 at 27549), to further reduce the risk of waterborne illness. In addition to the revised MCL for total coliforms, it established monitoring requirements, including sanitary surveys for systems collecting fewer than 5 samples per month, State review of sample citing plans, testing for either fecal coliforms or *E. coli* if a sample tests positive for total coliforms. Furthermore, in a separate final rule that was also published in the Federal Register of June 29, 1989 (54 FR 27486), EPA established filtration and disinfection treatment requirements for systems using surface water sources and stated that it intended to adopt additional disinfection requirements for systems using ground water sources.

2. MCL Based on Presence-Absence of Coliforms

Before amending its NPDWR on June 29, 1989 (54 FR 27544), EPA based compliance for total coliforms in drinking water on two MCL's (a single-sample MCL and a monthly average MCL) that specified a number of coliform bacteria detected in the sample, calculated as coliform density. The two MCL's varied according to the method used (Multiple Tube Fermentation (MTF) technique or Membrane Filter (MF) technique) and the sample volume (500 mL or 500 mL for MTF technique and 100 mL for MF technique). However, in its proposal of November 3, 1987 (52 FR 42224 at 42229), EPA stated that basin compliance with the MCL on a monthly average density calculation had been criticized because the variability of coliform counts greatly reduces the precision of this calculation (i.e., there is a large standard deviation). EPA further stated that basing compliance on the presence or absence of coliform bacteria rather than on coliform bacteria density would provide the following advantages: ease of detection; less influence of sample transit time; and greater mathematical precision in analytical findings because the calculation difficulties implicit in the statistical methodology of coliform density calculations would be eliminated. Therefore, under the amended NPDWR (54 FR 27544, June 29, 1989), EPA bases compliance with the MCL on the presence or absence of coliforms rather than on an estimate of coliform density.

In determining compliance with the revised MCL, EPA permits use of any one of the following four analytical methods: (1) The MTF technique, (2) the MF technique, (3) the Presence/Absence (P/A) Coliform test, and (4) the Minimal Media *ortho*-nitrophenyl-β-D-galactopyranoside, 4-methylumbelliferyl-β-D-glucuronide technique (Minimal Media ONPG-MUG technique), sometimes referred to as the Autoanalysis Colilert System. EPA recommends that, when the presence of heterotrophic bacteria in water samples interferes with the MTF technique, the MF technique, or the P/A Coliform test, water systems use the Minimal Media ONPG-MUG technique which is less prone to interference. In addition, EPA requires that a 100 mL standard sample volume be used, regardless of the method used for determining the presence of absence of coliforms in drinking water.

Federal Register/Vol. 58, No. 192/Wednesday, October 6, 1993/ Proposed Rules

For this complete listing, please contact the IAMFES Office at 1-800-369-6337, US; 1-800-284-6336 (Canada) or (515)276-3344.

Updates . . .

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Food and Environmental Hazards to Health

Update: Multistate Outbreak of *Escherichia coli* O157:H7 Infections from Hamburgers—Western United States, 1992-1993

From November 15, 1992, through February 28, 1993, more than 500 laboratory-confirmed infections with *E. coli O157:H7* and four associated deaths occurred in four states—Washington, Idaho, California, and Nevada. This report summarizes the findings from an ongoing investigation that identified a multistate outbreak resulting from consumption of hamburgers from one restaurant chain.

Washington

On January 13, 1993, a physician reported to the Washington Department of Health a cluster of children with hemolytic uremic syndrome (HUS) and an increase in emergency room visits for bloody diarrhea. During January 16-17, a case-control study comparing 16 of the first cases of bloody diarrhea or postdiarrheal HUS identified with age- and neighborhood-matched controls implicated eating at chain A restaurants during the week before symptom onset (matched odds ratio [OR]=undefined; lower confidence limit=3.5). On January 18, a multistate recall of unused hamburger patties from chain A restaurants was initiated.

As a result of publicity and case-finding efforts, during January-February 1993, 602 patients with bloody diarrhea or HUS were reported to the state health department. A total of 477 persons had illnesses meeting the case definition of culture-confirmed *E. coli* O157:H7 infection or postdiarrheal HUS. Of the 477 persons, 52 (11%) had close contact with a person with confirmed *E. coli* O157:H7 infection during the week preceding onset of symptoms. Of the remaining 425 persons, 372 (88%) reported eating in a chain A restaurant during the 9 days preceding onset of symptoms. Of the 338 patients who recalled what they ate in a chain A restaurant, 312 (92%) reported eating a regular-sized hamburger patty. Onsets of illness peaked from January 17 through January 20. Of the 477 case-patients, 144 (30%) were hospitalized, 30 developed HUS, and three died. The median age of patients was 7.5 years (range. O-74 years).

Idaho

Following the outbreak report from Washington, the Division of Health, Idaho Department of Health and Welfare, identified 14 persons with culture-confirmed *E. coli* O157:H7 infection, with illness onset dates from December 11, 1992, through February 16, 1993. Four persons were hospitalized; one developed HUS. During the week preceding illness onset, 13 (93%) had eaten at a chain A restaurant

California

In late December, the San Diego County Department of Health Services was notified of a child with *E. coli* O157:H7 infection who subsequently died. Active surveillance and record review then identified eight other persons with *E. coli* O157:H7 infections and record review then identified with other persons with *E. coli* O157:H7 infections or HUS from mid-November through mid-January 1993. Four of the nine reportedly had recently eaten at a chain A restaurant and four at a chain B restaurant in San Diego. After the Washington outbreak was reported, reviews of medical records at five hospitals revealed an overall 27% increase in visits or admissions for diarrhea during December 1992 and January 1993 compared with the same period 1 year earlier. A case was defined as postdiarrheal HUS, bloody diarrhea that was culture negative or not cultured, or any diarrheal illness in which stool culture yielded *E. coli* O157:H7 with onset from November 15, 1992, through January 31, 1993.

Illnesses of 34 patients met the case definition. The outbreak strain was identified in stool specimens of six patients. Fourteen persons were hospitalized, seven developed HUS, and one child died. The median age of case-patients was 10 years (range: 1-58 years). A case-control study of the first 25 case-patients identified and age- and sex-matched community controls implicated eating at a chain A restaurant in San Diego. A study comparing case-patients who ate at chain A restaurants with well meal companions implicated regular-sized hamburger patties (matched OR=undefined; lower confidence limit=1.3). Chain B was not statistically associated with illness.

Nevada

On January 22, after receiving a report of a child with HUS who had eaten at a local chain A restaurant, the Clark County (Las Vegas) Health District issued a press release requesting that persons with recent bloody diarrhea contact the health department. A case was defined as postdiarrheal HUS, bloody diarrhea that was culture negative or not cultured, or any diarrheal illness with a stool culture yielding the Washington strain of *E. coli* O157:H7, with onset from December 1, 1992, through February 7, 1993. Because local laboratories were not using sorbitol MacConkey (SMAC) medium to screen stools for *E. coli* O157:H7, this organism was not identified in any patient. After SMAC medium was distributed, the outbreak strain was detected in the stool of patient 38 days after illness onset.

Of 58 persons whose illnesses met the case definition, nine were hospitalized; three developed HUS. The median age was 30.5 years (range: 0-83 years). Analysis of the first 21 patients identified and age- and sex-matched community controls implicated eating at a chain A restaurant during the week preceding illness onset. A case-control study using well meal companions of case-patients also implicated eating hamburgers at chain A.

Other Investigation Findings

During the outbreak, chain A restaurants in Washington linked with cases primarily were serving regular-sized ham-

burger patties produced on November 19, 1992; some of the same meat was used in "jumbo" patties produced on November 20, 1992. The outbreak strain of *E. coli* O157:H7 was isolated from 11 lots of patties produced on those two dates; these lots had been distributed to restaurants in all states where illness occurred. Approximately 272,672 (20%) of the implicated patties were recovered by the recall.

A meat traceback by a CDC team identified five slaughter plants in the United States and one in Canada as the likely sources of carcasses used in the contaminated lots of meat and identified potential control points for reducing the likelihood of contamination. The animals slaughtered in domestic slaughter plants were traced to farms and auctions in six western states. No one slaughter plant or farm was identified as the source.

Further investigation of cases related to secondary transmission in families and child day care settings is ongoing.

Editorial Note: *E. coli* O157:H7 is a pathogenic gram-negative bacterium first identified as a cause of illness in 1982 during an outbreak of severe bloody diarrhea traced to contaminated hamburgers. This pathogen has since emerged as an important cause of both bloody diarrhea and HUS, the most common cause of acute renal failure in children. Outbreak investigations have linked most cases with the consumption of undercooked ground beef, although other food vehicles, including roast beef, raw milk, and apple cider, also have been implicated. Preliminary data from a CDC 2-year, nationwide, multicenter study revealed that when stools were routinely cultured for *E. coli* O157:H7 that organism was isolated more frequently than *Shigella* in four of 10 participating hospitals and was isolated from 7.8% of all bloody stools, a higher rate than for any other pathogen.

Infection with *E. coli* O157:H7 often is not recognized because most clinical laboratories do not routinely culture stools for this organism on SMAC medium, and many clinicians are unaware of the spectrum of illnesses associated with infection. The usual clinical manifestations are diarrhea (often bloody) and abdominal cramps; fever is infrequent. Younger age groups and the elderly are at highest risk for clinical manifestations and complications. Illness usually resolves after 6-8 days, but 2%-7% of patients develop HUS, which is characterized by hemolytic anemia, thrombocytopenia, renal failure, and a death rate of 3%-5%.

This report illustrates the difficulties in recognizing community outbreaks of *E. coli* O157:H7 in the absence of routine surveillance. Despite the magnitude of this outbreak, the problem may not have been recognized in three states if the epidemiologic link had not been established in Washington. Clinical laboratories should routinely culture stool specimens from persons with bloody diarrhea or HUS for *E. coli* O157:H7 using SMAC agar. When infections with *E. coli* O157:H7 are identified, they should be reported to local health departments for further evaluation and, if necessary, public health action to prevent further cases.

E. coli O157:H7 lives in the intestines of healthy cattle, and can contaminate meat during slaughter. CDC is collaborating with the U.S. Department of Agriculture's Food Safety Inspection Service to identify critical control points in processing as a component of a program to reduce the likelihood of pathogens such as *E. coli* O157:H7 entering the meat supply. Because slaughtering practices can result in contamination of raw meat with pathogens, and because the process of grinding beef may transfer pathogens from the surface of the meat to the interior, ground beef is likely to be internally contaminated. The optimal food protection practice is to cook ground beef thoroughly until the interior is no longer pink, and the juices are clear. In this outbreak, undercooking of hamburger patties likely played an important role. The Food and Drug Administration (FDA) has issued interim recommendations to increase the internal temperature for cooked hamburgers to 155 F (86.1 C) (FDA, personal communication, 1993).

Regulatory actions stimulated by the outbreak described in this report and the recovery of thousands of contaminated patties before they could be consumed emphasize the value of rapid public health investigations of outbreaks. The public health impact and increasing frequency of isolation of this pathogen underscore the need for improved surveillance for infections caused by *E. coli* O157:H7 and for HUS to better define the epidemiology of *E. coli* O157:H7.

Morbidity and Mortality Weekly Report 4/16/93

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Retail Food Operation Food Hazard Control Checklist

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Hospitality Institute of Technology and Management,
830 Transfer Road, Suite 35,
St. Paul, MN 55114

The following is the second installment of the Retail Food Operation Food Hazard Control Checklist mentioned in the October 1993 column. This checklist will be continued over the next several months to cover its entirety.

RETAIL FOOD OPERATION FOOD HAZARD CONTROL CHECKLIST
[40°F - 150°F (4.4°C - 65.6°C)] [1]

FOOD SAFETY CONTROL REQUIREMENTS	PERFORMANCE EVALUATION	NEEDED TO ASSURE SAFETY
HANDLING EMERGENCIES		
Procedures are documented and are adequate to handle: • **Crisis situations**. (Haz) All personnel are instructed to call 911 for emergencies which include fire, burglary, or any life threatening situation. • **Food related injury or illness**. (Reg) • **Power outage**. (Reg) • **Fire extinguisher discharge in the kitchen**. (Haz) • **A massive foodborne illness in the community**. (Haz)		
Improvement of unit performance. (Haz) FSPMs, supervisors, and employees are: • Constantly aware of environment, equipment, and facility and process performance, and take action immediately to correct problems; conduct systematic audits. • Evaluate prevention system weaknesses • Analyze the cause of problems • Take action through improved policies, procedures, and standards and system development to prevent future problems.		
First aid material • The first aid kit contains a supply of excellent quality surgical gloves that can be worn when any personnel touch blood or body fluids from another person. (Haz) • A first aid information chart illustrating the use of the emergency first aid procedure for choking is posted in the food preparation area. (Reg)		
Customer comment cards (Qual) • Customer comment cards are provided to encourage customer feedback. • A record of all customer comments concerning quality is maintained. • Corrective action resulting from customer comments will be discussed with the QMT before any policies, procedures, and standards are changed.		
PROGRAM ENFORCEMENT, RECOGNITION AND RENEWAL		
Management: (Haz) • Conducts and documents a **monthly** (or more often) **review** of the program effectiveness, and then plan for improving the program based on the findings. • Maintains an **enforcement statement** on safe food operation practices, food safety rules, and standard operating procedures. Disciplinary procedures are specified.		

Abbreviations: (Haz) = Hazard; (Reg) = Regulatory; (Qual) = Quality; (OSHA) = Occupational Safety and Health Agency

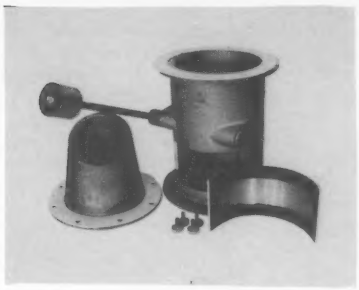
[1] Temperatures, unless otherwise stated, are food temperatures. They are measured both 1/16-inch below the surface as well as at the center of food in order to determine the degree of control and stability of hot and cold systems.

FOOD SAFETY CONTROL REQUIREMENTS	PERFORMANCE EVALUATION	NEEDED TO ASSURE SAFETY
• Conducts **verification audits** that to ensure that all hazards are identified, controls are adequate, and actual operations are in compliance with the company's policies, procedures and standards. • Maintains **records of disciplinary actions** and warnings. • Recognizes efforts and achievements of employees. • Renews enthusiasm by providing for celebration of safety achievements.		
PERSONNEL		
Employee responsibility (Haz) • Responsibility for safe food handling and good personal hygiene is practiced and can be described by employees.		
Individual illness (Reg) • No employee who is known to have a communicable illness which could be transferred directly by the employee or by employee contact with food is allowed to work in the preparation and service of food. • Supervisors are notifed by employees if illness symptoms include: nausea, diarrhea, and vomiting, or any other illness that is serious enough to be diagnosed by medical personnel. • If illness is not severe and symptoms are not acute, employees can be assigned to tasks that do not involve food handling or excused from work altogether until they are completely well.		
Gloves (OSHA) • Employees who need to wear heavy duty, non-disposable gloves to protect their hands from harsh chemicals (e.g., pot and pan washing) are given their own personal gloves that are not shared with any other person.		
Hand cuts and abrasions (Reg) • Supervisors observe employees for any infected lesions, boils, or other pathogenic skin conditions on food handlers. • If the infection is not severe and can be covered with a bandage and a waterproof protector (e.g., tight-fitting latex glove), the employee can continue working with food, providing they continue to use correct hand washing and change gloves as required. • If infection is severe, employees are excused from work until infection is sufficiently healed.		
Contact with blood or body fluids from another person (Haz) • Before any personnel touch the blood (e.g., if bandaging the wound of another individual) or any other body fluid such as vomitus of another person, they put on proper fitting latex gloves that prevent the body fluid from entering any cuts or breaks in the skin of their own hands.		
Personal Cleanliness (Reg) • All employees bathe daily and use a deodorant to control body odor. • Employees use only mild perfumes or colognes that will not interfere with the aroma of food. • Employees wear clean, closed-toe shoes, and clean uniforms, or full aprons or smocks over street clothing. • Clothing or outer covering is replaced if it becomes dirty while working.		
Fingernails (Haz) • Fingernails are neatly trimmed to less than 1/16-inch to make them easier to clean. • Employees do not wear fingernail polish or artificial fingernails while working.		
Hair restraint (Reg) • Hair restraints or other type of hair covering are worn by employees to prevent hair from falling into food.		
Jewelry and hard objects in pockets (Haz) • To prevent hard foreign objects from being found in food, employees avoid wearing jewelry on the hands, wrist, neck, and ears, and also avoid carrying hard objects such as pens, pencils, etc., in outside pockets while preparing and serving food. • Employees are permitted to wear plain wedding bands.		
Handkerchiefs and facial tissues (Haz) • Handkerchiefs or facial tissues are not carried into the food production or foodservice areas.		

FOOD SAFETY CONTROL REQUIREMENTS	PERFORMANCE EVALUATION	NEEDED TO ASSURE SAFETY
• Disposable facial tissues are placed at the hand washing sink where employees can use them and then wash their hands. • Employees sneeze or cough, by directing their head away from foods, toward the floor or into their shoulder, but NEVER their hands.		
Chewing gum, smoking, and eating (Reg) • Employees do not chew gum, eat, drink or smoke in the food production and foodservice areas.		
Personal medication (Reg) • Employees do not bring personal medications in the kitchen or food production area.		
Handling food in front of the customer (Reg) • Employees who serve food use utensils, plastic gloves, or paper sheets to handle and serve food in the presence of customers.		
Hand and fingertip washing (Haz) • All employees who prepare food in the kitchen or production area and who serve food wash their fingertips and hands properly and as often as required by tasks performed. • Employees use the double wash procedure (2×) which utilizes a fingernail brush to wash their hands at the following times. - Upon beginning a work shift. - When entering the kitchen. - After using the toilet. - After cleaning up vomitus or any fecal material. - After touching sores or bandages. • Employees use the single wash procedure (1×) at the following times: - Before and after coffee, food, or cigarette breaks. - After handling garbage. - After handling dirty dishes. - Between handling raw and cooked foods. - After blowing nose. - After touching skin, hair, beard, or soiled apron. - Before handling clean utensils, dishes, or single service items. - As often as necessary to keep hands clean after they become soiled. - After any absence the from work station.		
Unauthorized persons (Reg) • Are not allowed in the food production and utensil washing areas.		

*This **Retail Food Operation Food Hazard Control Checklist** will continue in subsequent issues of* Dairy, Food and Environmental Sanitation. *The January installment will cover: **Environment; Facilities; and Equipment.***

Industry Products



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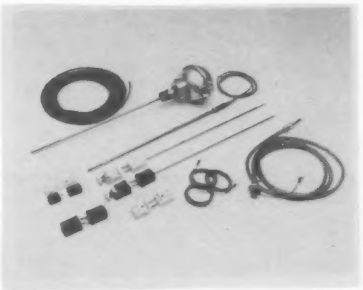

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(Patent Pending)

West Agro, Inc., a manufacturer of cleaners and sanitizers for dairy and food processing facilities, announces a new product in its chemical sanitation line.

The "Indicate Acid" is a blended, non-foaming acid detergent with a unique soil indicating system used for soak and C.I.P. cleaning of stainless steel parts and equipment. As an acid cleaner it effectively removes mineral scale and carbon deposits. However if the alkali cleaning step prior to acid cleaning fails in any way, the unique indicating dye will highlight any residual protein soils for easy inspection and correction.

West Agro, as one of the Tetra Laval companies, designs products to complement processing without compromising equipment.

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Highspeed Central Laboratory Milk Analysis System

Foss Food Technology announces the introduction of the CombiFoss 300 System for fat, protein, lactose, solids, and somatic cell analysis of milk.

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Intershield Floor Protection Systems, newly developed by Porter International, provide maximum floor protection through seven distinctly engineered systems designed for use in a wide range of Industrial and General Service environments.

Differing industrial environments and performance demands require specific floor protection solutions. Intershield Floor Protection Systems provide the optimal balance between durability, function, and aesthetics.

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Porter International - Louisville, KY

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WCR Plate Heat Exchanger Regasketing Brochure

For plate heat exchangers, this brochure outlines the fast, dependable, comprehensive, and economical regasketing services provided by WCR.

Gasket performance often depends on superior regasketing technology. The WCR ten-step regasketing process assures extended service life, even in the most difficult applications.

WCR regasketing services are more economical and reliable than comparable services offered by plate heat exchanger manufacturers. WCR regasketing is also more dependable than in-plant, do-it-yourself regasketing.

Regasketed and reconditioned plates are usually on their way back to the processor within two weeks of receipt. WCR exchange programs are available for selected plates.

WCR - Dayton, OH

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Concentrated Labware Cleaner

Manostat's CHROMERGE, supplied in packs of six 25 ml bottles of liquid containing chromium trioxide in solution, eliminates the toxic fumes and dangerous heating and shaking associated with making chromic-sulfuric cleaning solution. Once mixed, CHROMERGE can be stored and re-used until the color turns green, indicating loss of effectiveness.

CHROMERGE, when mixed according to instructions, produces a super-efficient chromic-sulfuric acid solution that safely removes stubborn deposit and does not etch the glassware. It leaves surfaces chemically clean permitting a perfect meniscus for precise volumetric work.

Available through laboratory supply dealers or contact Manostat Corporation.

Manostat Corporation - New York, NY

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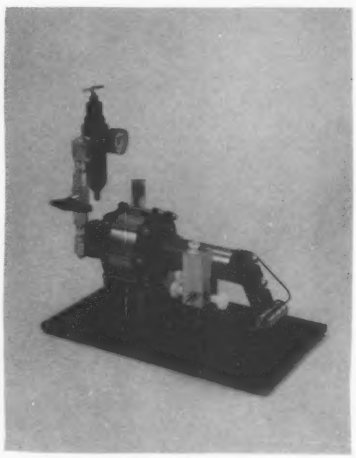

New M-110S Small Volume Microfluidizer® Optimizes Product Recovery

The new M-110S Small Volume Microfluidizer is now available from Microfluidics Corporation, a leading supplier of high technology equipment for the chemical, pharmaceutical, biotechnology, cosmetic and food industries. The new model is specifically designed for processors who require minimum sample sizes and optimum product recovery.

To accommodate precious applications, the M-110S processes batches as small as 10 ml. with 9 ml. recovery, and can process continuously as well. The unit achieves pressures as high as 14,000 psi and, weighing only 45 lbs., is portable and versatile. Other features include stainless steel construction, a removable 10 ft. cooling coil, and the option to reach 23,000 psi. Like all Microfluidizer equipment, the M-110S is guaranteed scalable from laboratory through production.

This air powered unit employs the patented Microfluidizer interaction chamber to produce a more uniform product and yield particle sizes as small as 0.1 micron. Unlike conventional equipment, the M-110S utilizes no moving parts and no grinding media in the process stream, so results are reproducible and scalable.

Microfluidics Corporation - Newton, MA

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Labconco's Redesigned RapidStill II for Kjeldahl Distillation is Made in U.S.A.

Labconco Corporation offers the RapidStill II as an automatic steam distillation unit for labs performing rapid Kjeldahl protein/nitrogen determinations. It serves as a companion to Labconco Rapid Digestors. The new RapidStill II is made in America with domestically produced components.

The RapidStill II has a built-in dispenser switch which allows the operator to control the amount of sodium hydroxide being added to the sample. A manually set audible timer alerts the operator when distillation is complete. Each distillation takes five to ten minutes.

The RapidStill II fits conveniently on a counter top or shelf and is ideal for labs requiring fast turnaround of KNA determinations. The RapidStill II produces steam using an 1100 watt heater element surrounding a 1000 ml flask. The condenser is equipped with a ventilation valve which prevents any siphoning of distillate back into the condenser chamber.

Labconco Corporation - Kansas City, MO

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Affiliate News

President of the Tennessee Association of Milk, Water and Food Protection, Wayne Crabtree

Minutes of the TAMWFP Meeting

The fall meeting of the Tennessee Association of Milk, Water and Food Protection was held November 10, 1993 at Ellington Agricultural Center, Nashville, TN. Fifty-one members and guests were present.

President Wayne Crabtree of Mayfield Dairy, Athens, TN presided. Hugh Wilson of Tennessee Department of Agriculture served as Session Chairman.

Harold Rose of the Tennessee Dairy Products Association, gave the Invocation.

A Dairy Regulatory Update was given by Tennessee Department of Agriculture staff. Dennis Lampley, Dairy Administrator, updated the group on regulatory activities. John Sanford, Milk Rating Officer, spoke on changes in Pasteurized Milk Ordinance. Dewain Patterson, Laboratory Evaluation Officer, spoke on changes in the laboratory certification program.

After a milk break, Steve Wilborn of the Consolidated Flavor Corporation, spoke on Vitamin Fortification of Milk.

A panel discussion of Fluid Milk Quality and Shelf Life was held. Professor Herbert Holt of the University of Tennessee, Knoxville, served as moderator. Panelists were: Charles Hilton, Fleming Dairy, Nashville; Gil Murrey, Heritage Farms Dairy, Murfreesboro; and Wayne Crabtree, Mayfield Dairy, Athens.

Jerry Baggett of TDA served as door prize chairman. Glenda Smead of TDA served as photographer. Mary Lou Hopper and Teresa Graves of TDA were in charge of registration and arrangements.

After lunch, members of the group toured the Tennessee Agricultural Museum.

Upcoming IAMFES Affiliate Meetings

1994

FEBRUARY

•**22, Georgia Association of Food and Environmental Sanitarians Annual Meeting** will be held at the Holiday Inn Airport North in Atlanta, Georgia. The subject for the meeting will be "Hot Topics in Food Safety." For more information, contact Mark Harrison at (706)542-2286.

APRIL

•**12-13, Carolina's Association of Milk, Food and Environmental Sanitarians** will meet in Greenville, SC. For more information, contact Beth Johnson at (803)935-6201.

OCTOBER

•**12-13, Iowa Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Best Western Starlite Village (formerly the Ramada Hotel), Waterloo, IA. For more information call Dale Cooper at (319)927-3212.

California Affiliate News

The Fall Dairy Industry Conference was held in conjunction with the California Dairy Industries Association at the Ontario Airport Hilton, Ontario, September 28-29. Over 161 people attended this annual educational event that featured several talks by Dr. Mike Doyle, Past President of IAMFES and Professor Bob Marshall of the University of Missouri. Doyle focused his presentations on the species of bacteria important to the dairy industry, including *E. coli* O157:H7, and *Listeria monocytogenes*. Marshall discussed the new sections of the 16th Editions of "Standard Methods."

During the meeting other topics discussed on plant and lab issues, new processing technologies and regulatory issues. During the breaks, the participants visited the 11 exhibitors.

Both the CDIA and CADMS held board meetings during the conference to plan the educational programs for 1994. The CADMS also held their annual business meeting and elected Les Wood, inspector in the California Department of Food and Agriculture as Recording Secretary, John Jackson of Food 4 Less as 2nd Vice President, Mostafa Sherzad as 1st Vice President and Nancy Ahern as President for 1994. Ahern and Sherzad both work in inspection for the California Department of Food and Agriculture. Dr. John C. Bruhn was reappointed as Executive Secretary and Delegate to the IAMFES.

The CADMS will again cooperate with CDIA in the statewide Spring Dairy Conference planned for February 23-24, 1994 at the Holiday Inn Capitol Plaza, Sacramento, California.

Award Winners at the California Association of Dairy and Milk Sanitarians Annual Meeting (left to right): Jack Pollock, 1992 Sanitarian of the Year; Tony Freeman, 1992 and 1993 President; and Robert Darrah, 1993 Sanitarian of the Year.

California Affiliate Recognizes Two at Annual Meeting

The California Association of Dairy and Milk Sanitarians (CADMS) *Sanitarian of the Year Award* was established years ago to recognize outstanding people who have distinguished themselves in their field and have contributed significantly and with distinction to the profession of the sanitarian. Nominations are annually invited and evaluated by the CADMS Executive Committee. An Award is not necessarily given each year.

The 1992 recipient was not able to attend the 1992 Annual Meeting so his recognition was announced during the Fall Annual Conference of the Association held September 28-29 at the Ontario (California) Airport Hilton.

The 1992 recipient is Bob Darrah who recently retired from Safeway after a very distinguished career of 31 years. Following graduation from Iowa State, Ames, Bob worked for an independent dairy processor that was later bought out by Fairmont Foods. After a short tenure with Fairmont Foods, he joined Safeway in Denver. Later he moved to California and developed a sanitation program in each Safeway plant that allowed each plant's lab to conduct the critical analyses necessary to insure that safe and wholesome products were produced. This successful program focused on creating sanitary processing environment.

His interest and knowledge about how to maintain the sanitary quality of the processing environment has been freely shared with those who have asked and all have profited by this exchange. He has authored papers on "how to keep it sanitary," and has authored the popular sanitation booklet on sanitation principles sold by IAMFES. He has served on several IAMFES plant sanitation committees. He is very active in industry meetings, learning and sharing.

Recently, he was involved in the critical experiments that evaluated a new method to sanitize hands which he discussed at the meeting. Bob continues in his retirement helping people and companies develop and perfect good sanitation programs.

The second person honored at the Annual Meeting was Jack Pollack whose career in the dairy industry spanned fifty years. His dairy industry career started in the 1940's when he worked during high school at Morgan's Dairy Farm in Torrance, a southern California town. At the farm he first worked as a milkman and then as a processor and relief milker.

After graduating from Redondo Union High School in 1946, he served two years in the Army's 82nd Airborne Division. His Army experience gave him the opportunity to attend college courtesy of the G. I. Bill. He first attended a junior college, The College of the Sequoias in Visalia, CA and then California Polytechnical State University, San Luis Obispo graduating in 1954 with a degree in dairy manufacturing.

He then worked for several dairy companies gaining considerable experience and expertise in processing. In 1961 he joined the California Department of Food and Agriculture (CDFA) where he worked until his retirement 30 years later in 1990. His first efforts were to direct the pesticide residue program for milk and cream. This successful effort provided a promotion to a dairy foods specialist and as a specialist he covered all aspects of product inspections. Ultimately, he became a USDA Grader and Survey Officer under the USDA and CDFA Cooperative Program.

Jack is an active member in many of the state's dairy associations, including CADMS where he served as President in 1984-1985. He always contributed to each association in which he held membership, encouraging the associations and members to strive a little higher for excellence.

Jack has many assets, but one which many mentioned was his teaching skills in introducing new inspectors to the business of inspection. He was often heard to say to a new inspector, "be firm when you have to, and lenient when you can, but above all be fair and honest to them all."

Both recipients were accompanied by their wives, Elsie Pollack and Laura Darrah.

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3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products Number 63-00 (08-17 as Amended)

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Sanitary fittings specifications heretofore or hereafter developed which so differ in design, material, construction, or otherwise, as not to conform with the following standards, but which in the manufacturer's or fabricator's opinion are equivalent or better may be submitted for the joint consideration of IAMFES, USPHS, and DIC at any time.

A

SCOPE

A.1

These standards cover the sanitary aspects of fittings used on processing equipment and on equipment and lines which hold or convey milk or milk products.

A.2

In order to conform to these 3-A Sanitary Standards, fittings shall comply with the following in design, material and fabrication criteria.

B

DEFINITIONS

B.1

Product: Shall mean milk and milk products.

B.2

SURFACES

B.2.1

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product and surfaces from which liquid may drain, drip, diffuse or be drawn into the product.

B.2.2

Nonproduct Contact Surfaces: Shall mean all other exposed surfaces.

B.3

Mechanical Cleaning or Mechanically Cleaned: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B.4

Electrodeposition: Shall mean coated to specific dimensions or processed to specified dimensions after electrodeposited coating.*[1]

C.

MATERIALS

C.1

Product contact surfaces shall be of stainless steel of the AISI 300 Series*[2] or corresponding ACI*[3] types (See Appendix, Section F.) or metal which is equal in cleanability to stainless steel of the foregoing types, and which under conditions of intended use is equally corrosion resistant, nontoxic and nonabsorbent except that:

C.1.1

Fittings made of materials provided for in C.1 may be covered with an electrodeposited coating of chromium.

C.1.2

Rubber and rubber-like materials may be used for gaskets, O-rings, seals and parts having the same functional purposes.

C.1.3

Rubber and rubber-like materials, when used for the above specified applications, shall conform to the applicable provisions of the current 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

C.1.4

Plastic materials may be used for fittings, gaskets, O-rings, seals, dust covers, sight and light openings and parts, having the same functional purposes.

C.1.5

Plastic materials, when used for the above specified applications, shall comply with to the applicable provisions of the current 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment Number 20-.

---

*[1] *QQ-C-320B-Federal Specification for Chromium Plating (Electrodeposited) July 25, 1974 with Amendment 4, April 10, 1987. The document is available from the General Services Administration, 18th & F Sts., NW, WFCIA, Washington, DC 20405 (202-472-2205) (Use most current edition).*

*[2] *The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, November 1990, Table 2-1, pp. 17-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-9460) (Use most current edition).*

*[3] *Steel Founders Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016 (708-299-9160).*

C.1.6

Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C.1.7

Rubber and rubber-like materials and plastic materials having product contact surfaces that are a bonded coating or a covering shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C.1.8

The final bond and residual adhesive, if used, on bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic.[*4]

C.1.9

Glass or plastic may be used in sight and/or light openings and when used, shall be of a clear, heat-resistant type.

C.1.10

Glass or plastic may be used for fittings specified in the current 3-A Accepted Practices for the Design, Fabrication and Installation of Milking and Milk Handling Equipment. Number 606- and, when used, shall be of a clear or transparent, heat-resistant type.

C.1.11

In a processing system to be sterilized by heat and operated at a temperature of 250 degrees F (121 degrees C) or higher, all materials having a product contact surface(s) used in the construction of fittings, gaskets and nonmetallic component parts shall be such that they can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250 degrees F (121 degrees C) and (2) operated at the temperature required for processing.

C.2

All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D

FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free crevices in the final fabricated form. (See Appendix, Section G.)

D.2

All permanent joints in metallic product contact surfaces shall be continuously welded, except that rolled-on fittings may be used as defined by the current 3-A Accepted Practices for the Design, Fabrication and Installation of Milking and Milk Handling Equipment, Number 606-, and the current 3-A Sanitary Standards for Farm Milk Cooling and Holding Tanks, Number 13-, and current 3-A Sanitary Standards for Farm Milk Storage Tanks, Number 30-. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices.

D.3

The minimum thickness of an electrodeposited coating shall not be less than 0.0002 in. (0.005 mm) for all product contact surfaces when used on stainless steel. when these surfaces are other than stainless steel, the minimum thickness of the electrodeposited coating shall not be less than 0.002 in. (0.05 mm).

D.4

Fittings that are to be mechanically cleaned shall be designed so that the product contact surfaces of fittings that are to be mechanically cleaned shall be so designed.

D.5

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection. Removable parts shall be readily demountable.

D.6

All product contact surfaces shall be self-draining when properly installed.

D.7

There shall be no threads on product contact surface except for those specified in Section E.1.

D.8

Removable fittings may be used with or without gaskets or 0-rings and shall be of such design as to form substantially flush interior joints.

D.9

Plain end fittings for use in welded sanitary pipelines must conform to the provisions of these standards with respect to material, finish and construction. The inside diameter of the butt welding ends shall be the same as that of the part to which it is to be welded.

D.10

GASKETS

D.10.1

Gaskets having a product contact surface shall be removable or bonded.

D.10.2

Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in such a manner that the bond is continuous and mechanically sound so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization, the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

[*4] *Adhesives shall comply with 21 CFR Part 175 - Indirect food additives. Adhesives and components of coatings. Document for sale by the Superintendent of Documents U.S. Government Office, Washington, DC 20402 (202-783-3238) (Use most current edition).*

D.10.3

Grooves in gaskets shall be no deeper than their width.

D.10.4

Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide except those for standard 0-rings smaller than 1/4 in. (6 mm) and those for self-centering clamp-style gaskets.

D.11

Radii

D.11.1

All internal angles of 135 degrees or less on product contact surfaces shall have radii of not less than 1/8 in. (3 mm) except that:

D.11.1.1

Smaller radii may be used when they are required for essential functional reasons, such as those in flat sealing surfaces. In no case shall such radii be less than 1/32 in. (1 mm).

D.11.1.2

The radii in gasket grooves, gasket retaining grooves, or grooves in gaskets shall be not less than 1/32 in. (1 mm).

D.11.1.3

The radii in grooves for standard 1/4 in. (6 mm) 0-rings shall not be less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) 0-rings shall be not less than 1/32 in. (1 mm).

D.12

Nonproduct contact surfaces shall have a smooth finish, free of pockets and crevices, and be readily cleanable and those surfaces to be coated shall be effectively prepared for coating.

E

SPECIAL CONSIDERATIONS

E.1

For special applications involving high pressure systems (greater than 250 psig/1750 kPa) with pipe or tube size of 1 in. (25 mm) outside diameter and under, American National Standard Unified Threads ("Vee-Threads") may be used on special fittings. Threads shall conform to ANSI B1.1 as indicated on Table-1 contained in Appendix Section H.1 of these standards. All internal angles on product contact surfaces shall have radii of not less than 1/32 in. (1 mm) except gasket recesses and grooves, in which all sharp corner shall be avoided.

E.2

Fittings used in a processing system to be sterilized by heat and operated at a temperature of 250 degrees F (121 degrees C) or higher shall comply with the following additional criteria:

E.2.1

The construction shall be such that all product contact surfaces can be sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250 degrees F (121 degrees C).

E.2.2

Fittings that have a product contact surface(s) to be used in such a processing system, not designed so that the system is automatically shut down if the product pressure in the system becomes less than that of the atmosphere and cannot be restarted until the system is resterilized, shall have a steam or other sterilizing medium chamber surrounding the fittings at the product contact surface. The fittings shall be constructed so that the steam chamber or other sterilizing medium chamber may be exposed for inspection.

APPENDIX

F

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08 percent. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades of stainless steel corresponding to type 302, 303, 304, and 316 are designated CF-20, CF-16F, CF-8 and CF-8M, respectively. The chemical composition of these cast grades are covered by ASTM[*5] specifications A351/A351M, A743/A743M and A744/A744M.

G

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D.1 herein. A maximum Ra of 32 micro in. (0.8 microm), when measured according to recommendations in ANSI/ASME B.46.1 - Surface Texture, is considered equivalent to a No. 4 finish.[*6]

H

THREAD SPECIFICATIONS

H.1

Screw Threads - High Pressure Applications
Table 1 Unified Screw Threads

TUBE SIZE INCH	THREAD SIZES	THREADS PER INCH	THREAD EXTERNAL	CLASS INTERNAL
1/4	9/16	18, 20	2A, 3A	2B
3/8	3/4	20	2A, 3A	2B
3/8	7/8	14	2A, 3A	2B
1/2	7/8	14, 20	2A, 3A	2B
5/8	1	14, 20	2A, 3A	2B
3/4	1 1/4	18	2A, 3A	2B
3/4	1 5/16	20	2A, 3A	2B
1	1 1/2	20	2A, 3A	2B

NOTE: ALL THREAD DIMENSIONS AND TOLERANCES MUST COMPLY WITH AMERICAN NATIONAL STANDARD ANSI B1.1 ENTITLED "UNIFIED INCH SCREW THREADS."

I

DIAGRAMS

These diagrams are intended to demonstrate general principles only, and are not intended to limit individual ingenuity. The design used should conform with the sanitary requirements set forth in these 3-A Sanitary Standards. The following examples are included in this Appendix:

[5] *Available from ASTM, 1916 Race St., Philadelphia, PA 19103-1187 (215-299-5400) (Use most current edition).*

[6] *Available from American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017 (212-705-7722) (Use most current edition).*

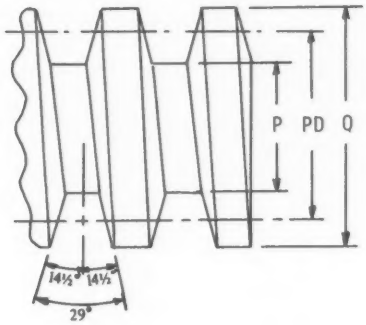
These standards are effective on November 21, 1993, at which time the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17 are rescinded, and become null and void.

Drawing	Page	3-A Drawing Number
General Purpose Acme Threads-Class 2G	741	3-A-6300-01
Fitting Name		
#2-CG Bend, #7-G Tee, #9-G Cross	742	3-A-6300-02
#2F Bend, #2FG Bend	742	3-A-6300-03
#2P Bend, #2PG Bend, #2K Bend, #2KG Bend	743	3-A-6300-04
#7-B Tee, #7-A Tee	744	3-A-6300-05
#7AG Tee, #7BG Tee	744	3-A-6300-06
#31-15G Reducer, #31-15 Reducer	745	3-A-6300-07
#32-15G Reducer, #32-15 Reducer	746	3-A-6300-08
#15-RG Ferrule, #15R-Ferrule, #14R-Ferrule, #14RG-Ferrule, #16A-Cap, #16AG-Cap	747	3-A-6300-09
Recessless Sanitary Unions	748	3-A-6300-10
13 SH Hex Nut	748	3-A-6300-11
2-E Bend, 7X Tee, 7AX Tee, 7BX Tee	749	3-A-6300-12
2EG Bend, 7XG Tee, 7AXG Tee, 7BXG Tee	750	3-A-6300-13

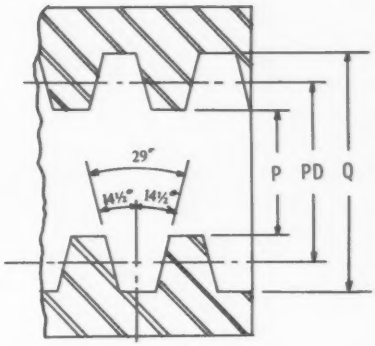
APPENDIX

H.2

GENERAL PURPOSE ACME THREADS - CLASS 2G



EXTERNAL THREAD



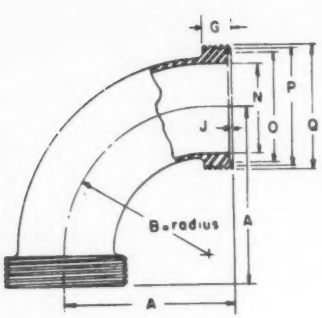
INTERNAL THREAD

SIZE	ACME THREADS PER INCH	P	Q	PITCH DIA.	TOLERANCE P, Q and P.D.
1	8	1.317	1.462	1.3995	+.000, -.018
1-1/2	8	1.849	1.994	1.9315	+.000, -.019
2	8	2.381	2.526	2.4635	+.000, -.020
2-1/2	8	2.913	3.058	2.9955	+.000, -.021
3	8	3.445	3.590	3.5275	+.000, -.022
4	6	4.509	4.695	4.6120	+.000, -.025

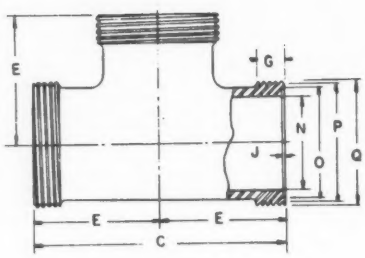
SIZE	ACME THREADS PER INCH	P	Q	PITCH DIA.	TOLERANCE P, Q and P.D.
1	8	1.352	1.497	1.4145	+.018, -.000
1-1/2	8	1.884	2.029	1.9465	+.019, -.000
2	8	2.416	2.561	2.4785	+.020, -.000
2-1/2	8	2.948	3.093	3.0105	+.021, -.000
3	8	3.480	3.625	3.5425	+.022, -.000
4	6	4.544	4.730	4.6270	+.025, -.000

THREAD DIMENSIONS

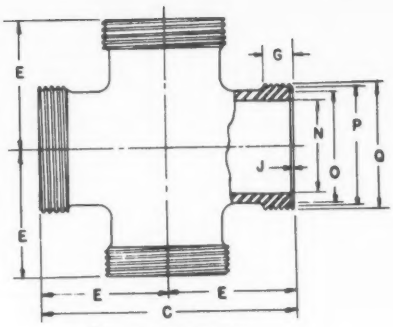
3-A Standard Sanitary Fittings 3-A-6300-01



*2-CG BEND



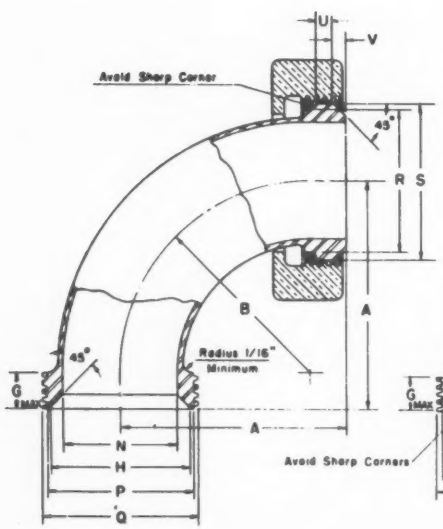
*7-G TEE



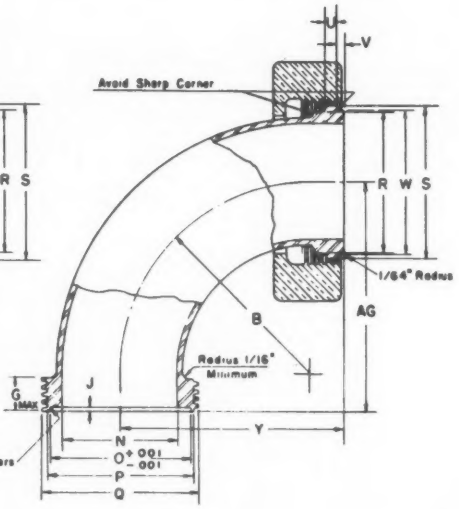
*9-G CROSS

SIZE	TUBE GAGE	ACME THREADS PER INCH	A	B	C	E	G_{MAX}	J	N	O $^{+.001}_{-.001}$	P	Q
1"	18	8	1-7/8"	1-1/2"	3-3/8"	1-11/16"	7/16"	.062	.902"	1.219"	1.317"	1.462"
1-1/2"	18	8	2-3/4"	2-1/4"	4-1/2"	2-1/4"	7/16"	.062	1.402"	1.750"	1.849"	1.994"
2"	16	8	3-9/16"	3"	5-1/4"	2-5/8"	7/16"	.062	1.870"	2.250"	2.381"	2.526"
2-1/2"	16	8	4-21/32"	4"	6"	3"	17/32"	.062	2.370"	2.750"	2.913"	3.058"
3"	16	8	5-23/32"	5"	6-5/8"	3-5/16"	9/16"	.062	2.870"	3.312"	3.445"	3.590"
4"	14	6	7-7/8"	7"	8-15/16"	4-15/32"	11/16"	.062	3.834"	4.312"	4.509"	4.695"

3-A Standard Sanitary Fittings 3-A-6300-02



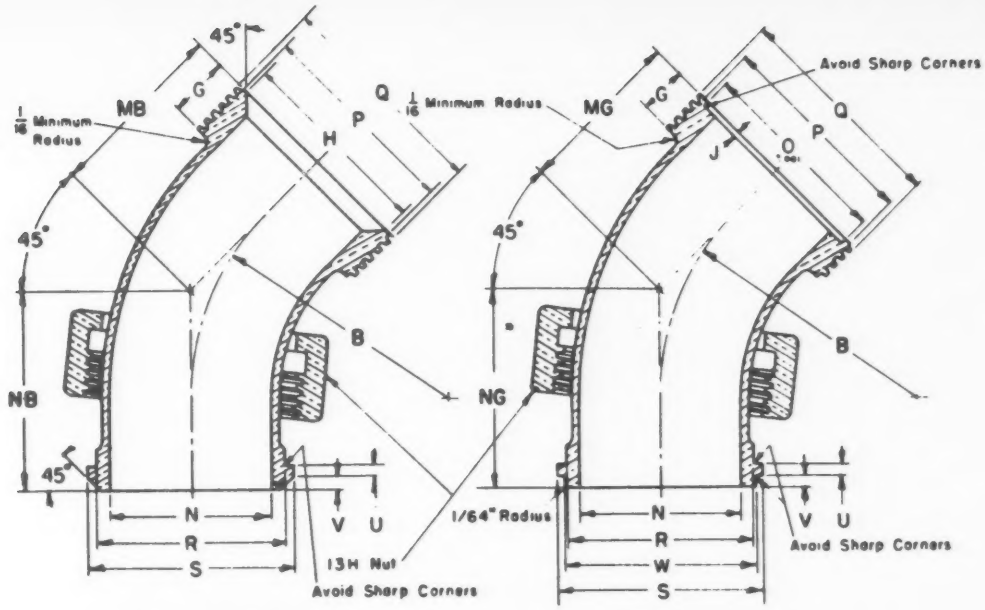
*2F BEND
GROUND SEAT TYPE



*2FG BEND
GASKET TYPE

3-A Standard Sanitary Fittings 3-A-6300-03

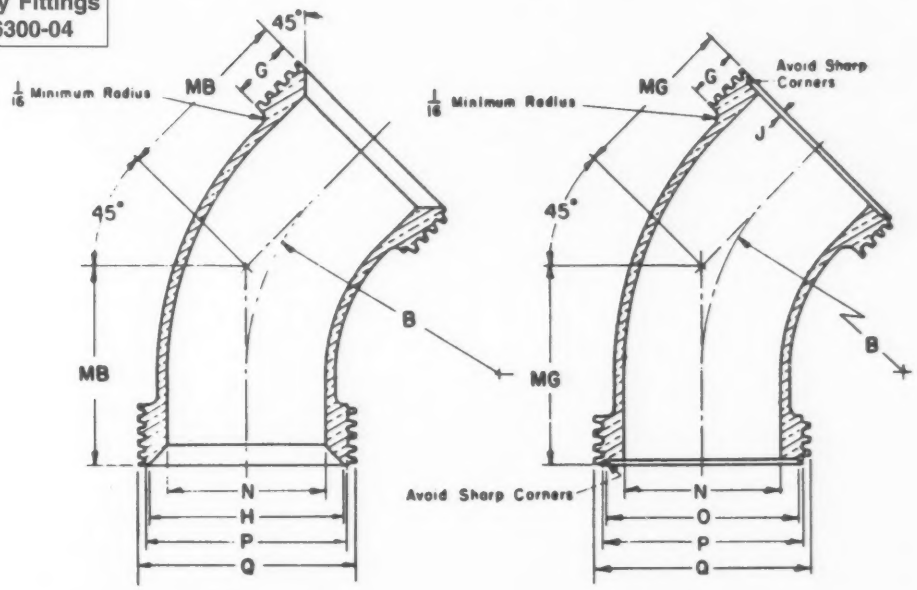
SIZE	Acme Threads Per Inch	B	AG	Ground Seat Type			Gasket Type			A	N	O	P	Q	R	S	Ground Seat	Gasket Type	W	Y
				V	G	H	V	G	J								U	U		
1"	8	1-1/2"	1-7/8"	1/8"	9/16"	1-3/16"	3/32"	7/16"	.062"	2"	.902"	1.219"	1.317"	1.462"	1.160"	1.316"	3/16"	9/64"	1.187"	1-59/64"
1-1/2"	8	2-1/4"	2-3/4"	5/32"	9/16"	1-23/32"	3/32"	7/16"	.062"	2-7/8"	1.402"	1.750"	1.849"	1.994"	1.676"	1.848"	3/16"	9/64"	1.718"	2-49/64"
2"	8	3"	3-9/16"	5/32"	19/32"	2-1/4"	3/32"	7/16"	.062"	3-23/32"	1.870"	2.250"	2.381"	2.526"	2.192"	2.380"	1/4"	7/32"	2.218"	3-5/8"
2-1/2"	8	4"	4-21/32"	3/16"	23/32"	2-3/4"	3/32"	17/32"	.062"	4-27/32"	2.370"	2.750"	2.913"	3.058"	2.708"	2.912"	1/4"	7/32"	2.718"	4-23/32"
3"	8	5"	5-23/32"	3/16"	3/4"	3-5/16"	3/32"	9/16"	.062"	5-29/32"	2.870"	3.312"	3.445"	3.590"	3.224"	3.444"	9/32"	1/4"	3.280"	5-25/32"
4"	6	7"	7-7/8"	1/4"	7/8"	4-1/4"	7/64"	11/16"	.062"	8-1/16"	3.834"	4.312"	4.509"	4.695"	4.256"	4.508"	5/16"	9/32"	4.280"	7-57/64"



No. 2P BEND
Ground Seat Type

No. 2PG BEND
Gasket Seat Type

3-A Standard Sanitary Fittings 3-A-6300-04

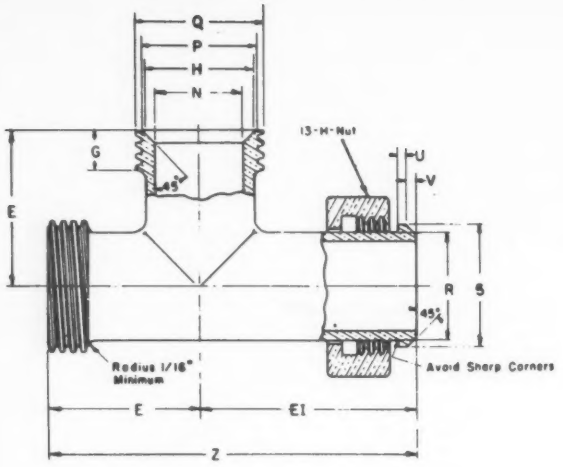


No. 2K BEND
Ground Seat Type

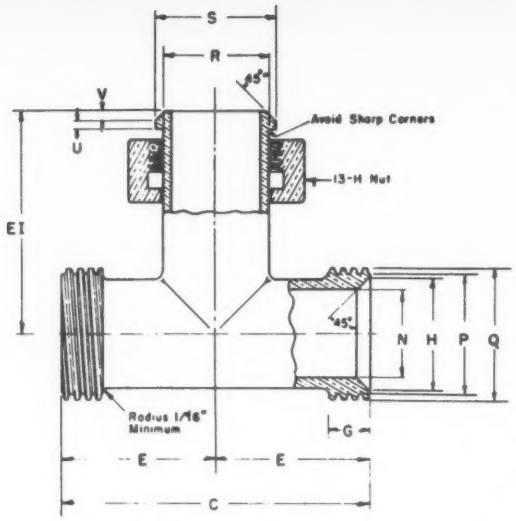
No. 2KG BEND
Gasket Seat Type

SIZE	Acme Threads Per Inch	Ground Seat		Gasket Seat		B	Ground Seat			Gasket Seat			N	O	P	Q	R	S	Ground Seat	Gasket Type	W
		NB	MB	NG	MG		V	G_{MAX}	H	V	G_{MAX}	J							U	U	
1"	8	2-1/8"	1-5/16"	2-3/64"	1-3/16"	1-1/2"	1/8"	9/16"	1-3/16"	3/32"	7/16"	.062	.902"	1.219"	1.317"	1.462"	1.160"	1.316"	3/16"	9/64"	1.187"
1-1/2"	8	2-1/8"	1-23/32"	2-1/64"	1-19/32"	2-1/4"	5/32"	9/16"	1-23/32"	3/32"	7/16"	.062	1.402"	1.750"	1.849"	1.994"	1.676"	1.848"	3/16"	9/64"	1.718"
2"	8	2-5/16"	2-1/8"	2-7/32"	1-31/32"	3"	5/32"	19/32"	2-1/4"	3/32"	7/16"	.062	1.870"	2.250"	2.381"	2.526"	2.192"	2.380"	1/4"	7/32"	2.218"
2-1/2"	8	2-9/16"	2-5/8"	2-7/16"	2-7/16"	4"	5/32"	23/32"	2-3/4"	3/32"	17/32"	.062	2.370"	2.750"	2.913"	3.058"	2.708"	2.912"	1/4"	7/32"	2.718"
3"	8	2-29/32"	3-1/8"	2-25/32"	2-15/16"	5"	3/16"	3/4"	3-5/16"	3/32"	9/16"	.062	2.870"	3.312"	3.445"	3.590"	3.224"	3.444"	9/32"	1/4"	3.280"
4"	6	3-7/8"	4-1/4"	3-45/64"	4-1/16"	7"	1/4"	7/8"	4-1/4"	7/64"	11/16"	.062	3.834"	4.312"	4.509"	4.695"	4.256"	4.508"	5/16"	9/32"	4.280"

Dimensions in Above Table are Shown in Inches.
Dimensions Not Specified Are Not Standardized Since They Bear No Relation to Interchangeability



No 7-B TEE

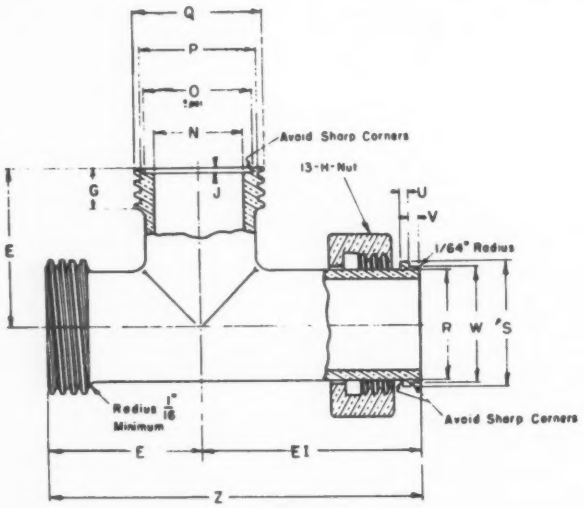


No. 7-A TEE

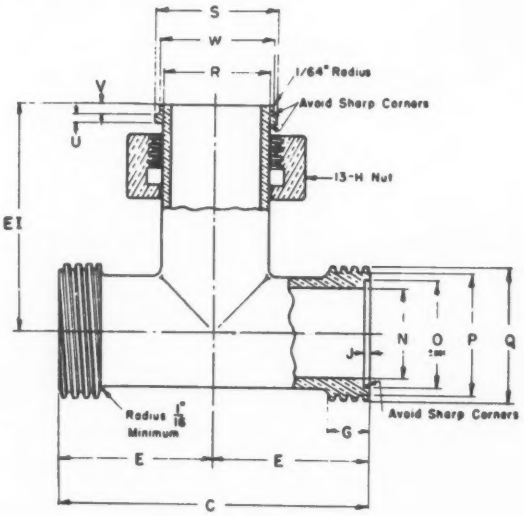
SIZE	ACME THREADS PER INCH	C	E	V	G_{MAX}	EI	H	N	P	Q	R	S	U	Z
1	8	3-5/8	1-13/16	1/8	9/16	2-11/16	1-3/16	.902	1.317	1.462	1.160	1.316	3/16	4-1/2
1-1/2	8	4-3/4	2-3/8	5/32	9/16	3-13/32	1-23/32	1.402	1.849	1.994	1.676	1.848	3/16	5-25/32
2	8	5-9/16	2-25/32	5/32	19/32	3-13/16	2-1/4	1.870	2.381	2.526	2.192	2.380	1/4	6-19/32
2-1/2	8	6-3/8	3-3/16	3/16	23/32	4-1/4	2-3/4	2.370	2.913	3.058	2.708	2.912	1/4	7-7/16
3	8	7	3-1/2	3/16	3/4	4-5/8	3-5/16	2.870	3.445	3.590	3.224	3.444	9/32	8-1/8
4	6	9-15/16	4-21/32	1/4	7/8	6-1/8	4-1/4	3.834	4.509	4.695	4.256	4.508	5/16	10-25/32

3-A Standard Sanitary Fittings 3-A-6300-05

Dimensions in Above Table are Shown in Inches.
Dimensions Not Specified Are Not Standardized Since They Bear No Relation to Interchangeability.



No 7BG-TEE

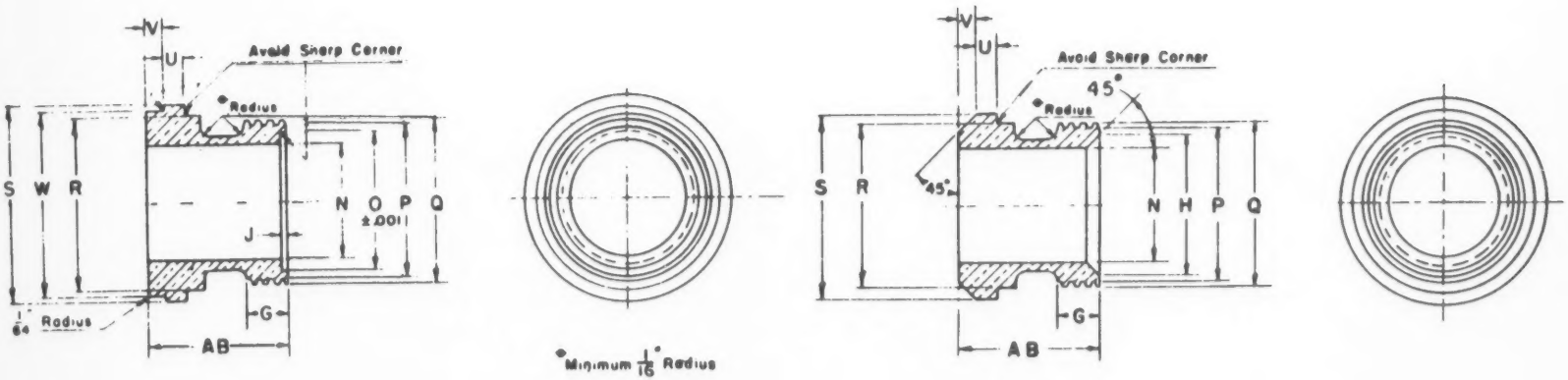


No 7AG-TEE

SIZE	ACME THREADS PER INCH	C	E	V	G_{MAX}	EI	J	N	O	P	Q	R	S	U	W	Z
1	8	3-3/8	1-11/16	3/32	7/16	2-39/64	.062	.902	1.219	1.317	1.462	1.160	1.316	9/64	1.187	4-19/64
1-1/2	8	4-1/2	2-1/4	3/32	7/16	3-19/64	.062	1.402	1.750	1.849	1.994	1.676	1.848	9/64	1.718	5-35/64
2	8	5-1/4	2-5/8	3/32	7/16	3-23/32	.062	1.870	2.250	2.381	2.526	2.192	2.380	7/32	2.218	6-11/32
2-1/2	8	6	3	3/32	17/32	4-1/8	.062	2.370	2.750	2.913	3.058	2.708	2.912	7/32	2.718	7-1/8
3	8	6-5/8	3-5/16	3/32	9/16	4-1/2	.062	2.870	3.312	3.445	3.590	3.224	3.444	1/4	3.280	7-13/16
4	6	8-15/16	4-15/32	7/64	11/16	5-61/64	.062	3.834	4.312	4.509	4.695	4.256	4.508	9/32	4.280	10-27/64

3-A Standard Sanitary Fittings 3-A-6300-06

Dimensions in Above Table are Shown in Inches.
Dimensions Not Specified Are Not Standardized Since They Bear No Relation to Interchangeability



	SIZE	ACME THREADS PER INCH	AB	V	G_{MAX}	J	N	O	P	Q	R	S	U	W
	1-1/2" x 1"	8	2-17/64"	3/32"	7/16"	.062"	.902"	1.219"	1.317"	1.462"	1.676"	1.848"	9/64"	1.718"
	2" x 1"	8	2-9/32"	3/32"	7/16"	.062"	.902"	1.219"	1.317"	1.462"	2.192"	2.380"	7/32"	2.218"
	2" x 1-1/2"	8	2-9/32"	3/32"	7/16"	.062"	1.402"	1.750"	1.849"	1.994"	2.192"	2.380"	7/32"	2.218"
*	2-1/2" x 1"	8	2-1/4"	3/32"	7/16"	.062"	.902"	1.219"	1.317"	1.462"	2.708"	2.912"	7/32"	2.718"
	2-1/2"x1-1/2"	8	2-1/4"	3/32"	7/16"	.062"	1.402"	1.750"	1.849"	1.994"	2.708"	2.912"	7/32"	2.718"
	2-1/2" x 2"	8	2-5/16"	3/32"	7/16"	.062"	1.870"	2.250"	2.381"	2.526"	2.708"	2.912"	7/32"	2.718"
*	3" x 1"	8	2-1/4"	3/32"	7/16"	.062"	.902"	1.219"	1.317"	1.462"	3.224"	3.444"	1/4"	3.280"
	3" x 1-1/2"	8	2-1/4"	3/32"	7/16"	.062"	1.402"	1.750"	1.849"	1.994"	3.224"	3.444"	1/4"	3.280"
	3" x 2"	8	2-5/16"	3/32"	7/16"	.062"	1.870"	2.250"	2.381"	2.526"	3.224"	3.444"	1/4"	3.280"
	3" x 2-1/2"	8	2-13/32"	3/32"	17/32"	.062"	2.370"	2.750"	2.913"	3.058"	3.224"	3.444"	1/4"	3.280"
*	4" x 1"	8	2-13/64"	7/64"	7/16"	.062"	.902"	1.219"	1.317"	1.462"	4.256"	4.508"	9/32"	4.280"
*	4" x 1-1/2"	8	2-13/64"	7/64"	7/16"	.062"	1.402"	1.750"	1.849"	1.994"	4.256"	4.508"	9/32"	4.280"
	4" x 2"	8	2-17/64"	7/64"	7/16"	.062"	1.870"	2.250"	2.381"	2.526"	4.256"	4.508"	9/32"	4.280"
	4" x 2-1/2"	8	2-23/64"	7/64"	17/32"	.062"	2.370"	2.750"	2.913"	3.058"	4.256"	4.508"	9/32"	4.280"
	4" x 3"	8	2-27/64"	7/64"	9/16"	.062"	2.870"	3.312"	3.445"	3.590"	4.256"	4.508"	9/32"	4.280"

* Special Order Only

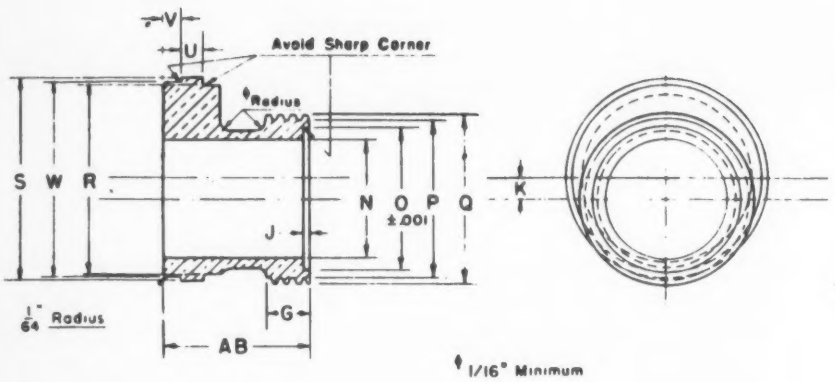
#31-15G REDUCER

	SIZE	ACME THREADS PER INCH	AB	V	G_{MAX}	H	N	P	Q	R	S	U
	1-1/2" x 1"	8	2-1/2"	5/32"	9/16"	1-3/16"	.902"	1.317"	1.462"	1.676"	1.848"	3/16"
	2" x 1"	8	2-1/2"	5/32"	9/16"	1-3/16"	.902"	1.317"	1.462"	2.192"	2.380"	1/4"
	2" x 1-1/2"	8	2-1/2"	5/32"	9/16"	1-23/32"	1.402"	1.849"	1.994"	2.192"	2.380"	1/4"
*	2-1/2" x 1"	8	2-1/2"	3/16"	9/16"	1-3/16"	.902"	1.317"	1.462"	2.708"	2.912"	1/4"
	2-1/2"x1-1/2"	8	2-1/2"	3/16"	9/16"	1-23/32"	1.402"	1.849"	1.994"	2.708"	2.912"	1/4"
	2-1/2" x 2"	8	2-19/32"	3/16"	19/32"	2-1/4"	1.870"	2.381"	2.526"	2.708"	2.912"	1/4"
*	3" x 1"	8	2-1/2"	3/16"	9/16"	1-3/16"	.902"	1.317"	1.462"	3.224"	3.444"	9/32"
	3" x 1-1/2"	8	2-1/2"	3/16"	9/16"	1-23/32"	1.402"	1.849"	1.994"	3.224"	3.444"	9/32"
	3" x 2"	8	2-19/32"	3/16"	19/32"	2-1/4"	1.870"	2.381"	2.526"	3.224"	3.444"	9/32"
	3" x 2-1/2"	8	2-23/32"	3/16"	23/32"	2-3/4"	2.370"	2.913"	3.058"	3.224"	3.444"	9/32"
*	4" x 1"	8	2-1/2"	1/4"	9/16"	1-3/16"	.902"	1.317"	1.462"	4.256"	4.508"	5/16"
*	4" x 1-1/2"	8	2-1/2"	1/4"	9/16"	1-23/32"	1.402"	1.849"	1.994"	4.256"	4.508"	5/16"
	4" x 2"	8	2-19/32"	1/4"	19/32"	2-1/4"	1.870"	2.381"	2.526"	4.256"	4.508"	5/16"
	4" x 2-1/2"	8	2-23/32"	1/4"	23/32"	2-3/4"	2.370"	2.913"	3.058"	4.256"	4.508"	5/16"
	4" x 3"	8	2-25/32"	1/4"	3/4"	3-5/16"	2.870"	3.445"	3.590"	4.256"	4.508"	5/16"

* Special Order Only

#31-15 REDUCER

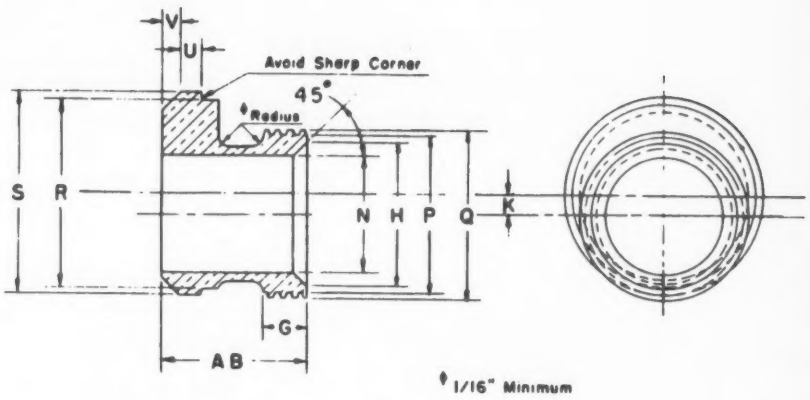
3-A Standard Sanitary Fittings 3-A-6300-07



SIZE	ACME THREADS PER INCH	AB	V	G_{MAX}	J	K	N	O	P	Q	R	S	U	W
1-1/2" x 1"	8	2-17/64"	3/32"	7/16"	.062"	.250"	.902"	1.219"	1.317"	1.462"	1.676"	1.848"	9/64"	1.718"
2" x 1"	8	2-9/32"	3/32"	7/16"	.062"	.484"	.902"	1.219"	1.317"	1.462"	2.192"	2.380"	7/32"	2.218"
2" x 1-1/2"	8	2-9/32"	3/32"	7/16"	.062"	.234"	1.402"	1.750"	1.849"	1.994"	2.192"	2.380"	7/32"	2.218"
* 2-1/2" x 1"	8	2-1/4"	3/32"	7/16"	.062"	.734"	.902"	1.219"	1.317"	1.462"	2.708"	2.912"	7/32"	2.718"
2-1/2"x1-1/2"	8	2-1/4"	3/32"	7/16"	.062"	.484"	1.402"	1.750"	1.849"	1.994"	2.708"	2.912"	7/32"	2.718"
2-1/2" x 2"	8	2-5/16"	3/32"	7/16"	.062"	.250"	1.870"	2.250"	2.381"	2.526"	2.708"	2.912"	7/32"	2.718"
* 3" x 1"	8	2-1/4"	3/32"	7/16"	.062"	.964"	.902"	1.219"	1.317"	1.462"	3.224"	3.444"	1/4"	3.280"
3" x 1-1/2"	8	2-1/4"	3/32"	7/16"	.062"	.734"	1.402"	1.750"	1.849"	1.994"	3.224"	3.444"	1/4"	3.280"
3" x 2"	8	2-5/16"	3/32"	7/16"	.062"	.500"	1.870"	2.250"	2.381"	2.526"	3.224"	3.444"	1/4"	3.280"
3" x 2-1/2"	8	2-13/32"	3/32"	7/32"	.062"	.250"	2.370"	2.750"	2.913"	3.058"	3.224"	3.444"	1/4"	3.280"
* 4" x 1"	8	2-13/64"	7/64"	7/16"	.062"	1.466"	.902"	1.219"	1.317"	1.462"	4.256"	4.508"	9/32"	4.280"
* 4" x 1-1/2"	8	2-13/64"	7/64"	7/16"	.062"	1.216"	1.402"	1.750"	1.849"	1.994"	4.256"	4.508"	9/32"	4.280"
4" x 2"	8	2-17/64"	7/64"	7/16"	.062"	.982"	1.870"	2.250"	2.381"	2.526"	4.256"	4.508"	9/32"	4.280"
4" x 2-1/2"	8	2-23/64"	7/64"	17/32"	.062"	.732"	2.370"	2.750"	2.913"	3.058"	4.256"	4.508"	9/32"	4.280"
4" x 3"	8	2-27/64"	7/64"	9/16"	.062"	.482"	2.870"	3.312"	3.445"	3.590"	4.256"	4.508"	9/32"	4.280"

* Special Order Only

#32-15G REDUCER

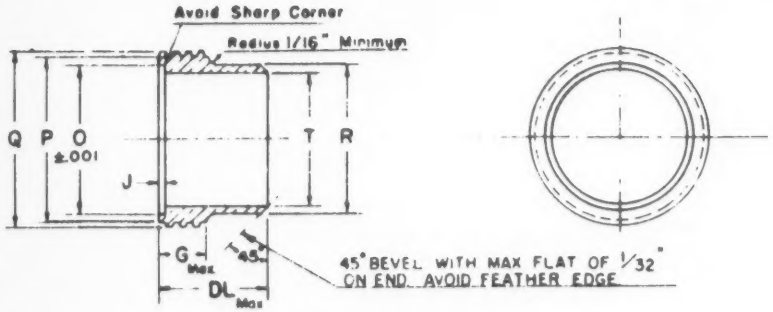


SIZE	ACME THREADS PER INCH	AB	V	G_{MAX}	H	K	N	P	Q	R	S	U
1-1/2" x 1"	8	2-1/2"	5/32"	9/16"	1-3/16"	.250"	.902"	1.317"	1.462"	1.676"	1.848"	3/16"
2" x 1"	8	2-1/2"	5/32"	9/16"	1-3/16"	.484"	.902"	1.317"	1.462"	2.192"	2.380"	1/4"
2" x 1-1/2"	8	2-1/2"	5/32"	9/16"	1-23/32"	.234"	1.402"	1.849"	1.994"	2.192"	2.380"	1/4"
* 2-1/2" x 1"	8	2-1/2"	3/16"	9/16"	1-3/16"	.734"	.902"	1.317"	1.462"	2.708"	2.912"	1/4"
2-1/2"x1-1/2"	8	2-1/2"	3/16"	9/16"	1-23/32"	.484"	1.402"	1.849"	1.994"	2.708"	2.912"	1/4"
2-1/2" x 2"	8	2-19/32"	3/16"	19/32"	2-1/4"	.250"	1.870"	2.381"	2.526"	2.708"	2.912"	1/4"
* 3" x 1"	8	2-1/2"	3/16"	9/16"	1-3/16"	.984"	.902"	1.317"	1.462"	3.224"	3.444"	9/32"
3" x 1-1/2"	8	2-1/2"	3/16"	9/16"	1-23/32"	.734"	1.402"	1.849"	1.994"	3.224"	3.444"	9/32"
3" x 2"	8	2-19/32"	3/16"	19/32"	2-1/4"	.500"	1.870"	2.381"	2.526"	3.224"	3.444"	9/32"
3" x 2-1/2"	8	2-23/32"	3/16"	23/32"	2-3/4"	.250"	2.370"	2.913"	3.058"	3.224"	3.444"	9/32"
* 4" x 1"	8	2-1/2"	1/4"	9/16"	1-3/16"	1.466"	.902"	1.317"	1.462"	4.256"	4.508"	5/16"
* 4" x 1-1/2"	8	2-1/2"	1/4"	9/16"	1-23/32"	1.216"	1.402"	1.849"	1.994"	4.256"	4.508"	5/16"
4" x 2"	8	2-19/32"	1/4"	19/32"	2-1/4"	.982"	1.870"	2.381"	2.526"	4.256"	4.508"	5/16"
4" x 2-1/2"	8	2-23/32"	1/4"	23/32"	2-3/4"	.732"	2.370"	2.913"	3.058"	4.256"	4.508"	5/16"
4" x 3"	8	2-25/32"	1/4"	3/4"	3-5/16"	.482"	2.870"	3.445"	3.590"	4.256"	4.508"	5/16"

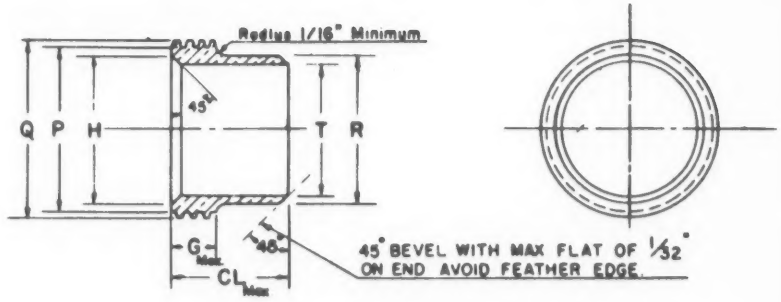
* Special Order Only

#32-15 REDUCER

3-A Standard Sanitary Fittings 3-A-6300-08



*15RG-FERRULE



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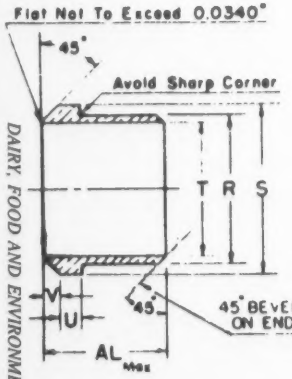
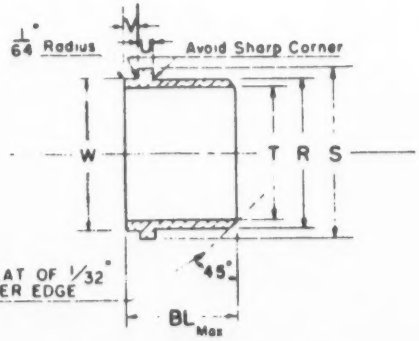


*14R-FERRULE



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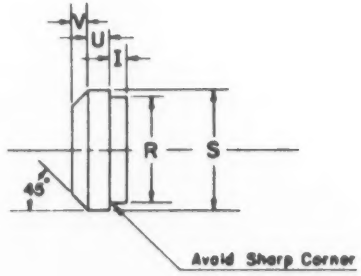
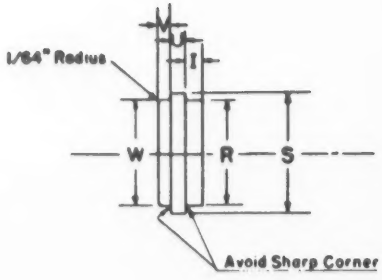


*16A-CAP

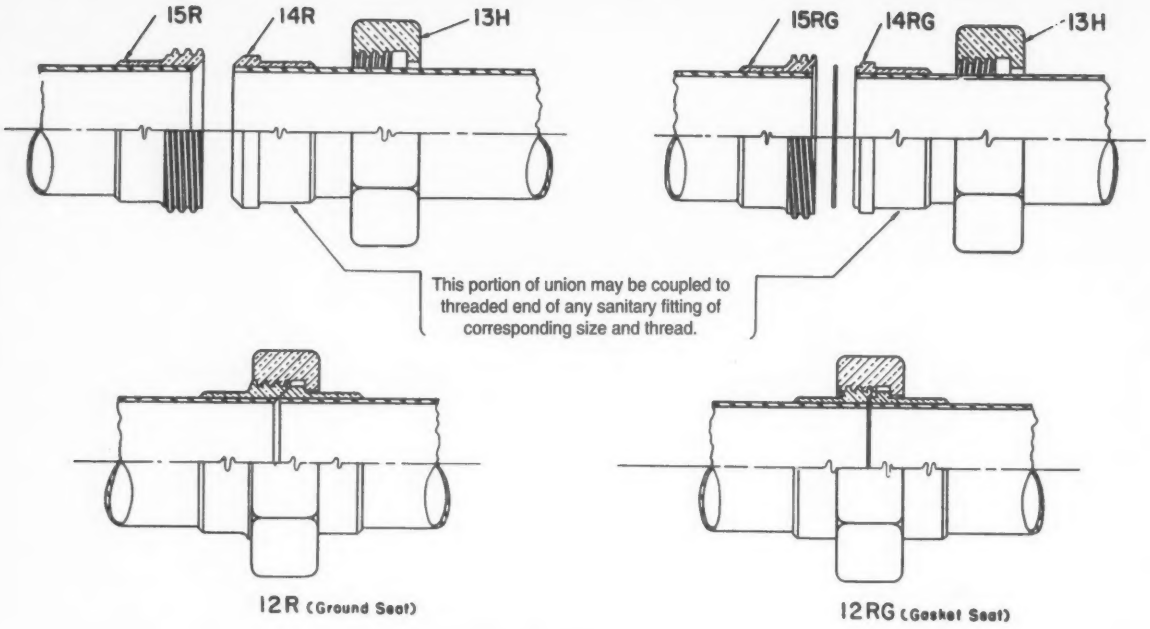


*16AG-CAP

SIZE	ACME THREADS PER INCH	AL	BL	CL	DL	I	Ground Seat Type			Gasket Type			O	P	Q	R	S	T	Ground Seat U	Gasket Type U	W
							V	G	H	V	G	J									
1"	8	3/4"	43/64"	13/16"	11/16"	5/32"	1/8"	9/16"	1-3/16"	3/32"	7/16"	.062"	1.219"	1.317"	1.462"	1.160"	1.316"	1.005"	3/16"	9/64"	1.187"
1-1/2"	8	1-1/8"	1-1/64"	1-1/8"	1"	7/32"	5/32"	9/16"	1-23/32"	3/32"	7/16"	.062"	1.750"	1.849"	1.994"	1.676"	1.848"	1.505"	3/16"	9/64"	1.718"
2"	8	1-5/16"	1-7/32"	1-3/8"	1-7/32"	7/32"	5/32"	19/32"	2-1/4"	3/32"	7/16"	.062"	2.250"	2.381"	2.526"	2.192"	2.380"	2.005"	1/4"	7/32"	2.218"
2-1/2"	8	1-3/8"	1-1/4"	1-1/2"	1-5/16"	7/32"	3/16"	23/32"	2-3/4"	3/32"	17/32"	.062"	2.750"	2.913"	3.058"	2.708"	2.912"	2.505"	1/4"	7/32"	2.718"
3"	8	1-7/16"	1-5/16"	1-5/8"	1-7/16"	1/4"	3/16"	3/4"	3-15/16"	3/32"	9/16"	.062"	3.312"	3.445"	3.590"	3.224"	3.444"	3.005"	9/32"	1/4"	3.280"
4"	6	1-1/2"	1-21/64"	1-5/8"	1-7/16"	1/4"	1/4"	7/8"	4-1/4"	7/64"	11/16"	.062"	4.312"	4.509"	4.695"	4.256"	4.508"	4.005"	5/16"	9/32"	4.280"

Dimensions Not Specified Are Not Standardized Since They Bear No Relation to Interchangeability.

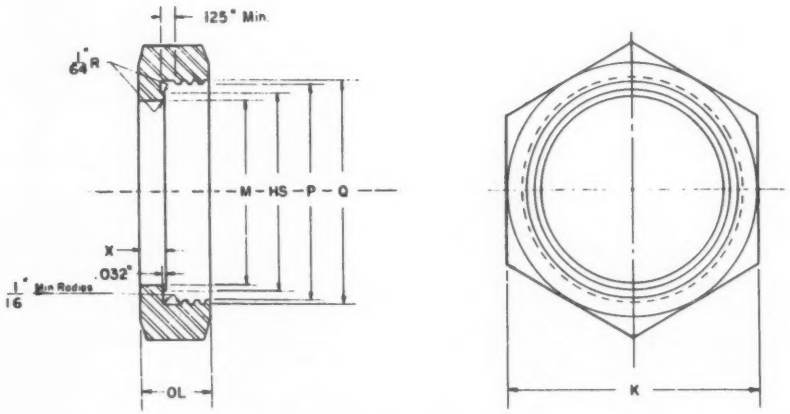
3-A Standard Sanitary Fittings 3-A-6300-09



RECESSLESS SANITARY UNIONS

Recessless ferrule is attached to pipe with end of pipe projecting slightly through ferrule. End of pipe and ferrule are then faced flush with facing tool.

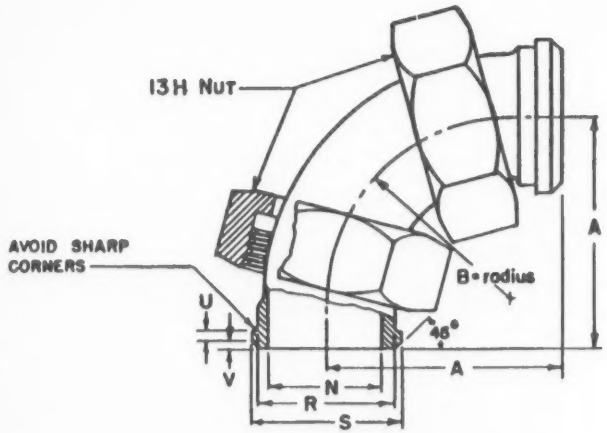
3-A Standard Sanitary Fittings 3-A-6300-10



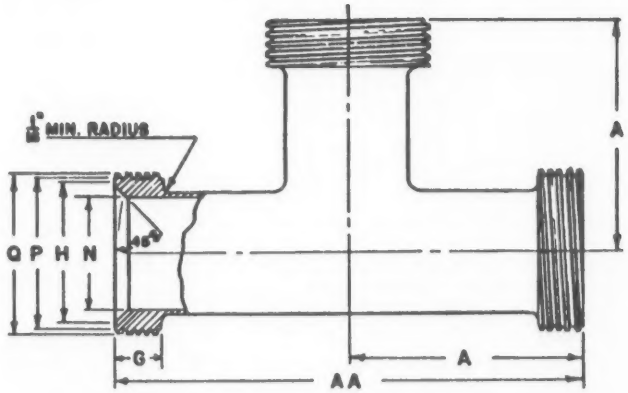
SIZE	ACME THREADS PER INCH	OL	HS	K	M	P	Q	X
1"	8	.750	1.187	1.812	1.015	1.352	1.497	.312
1-1/2"	8	.812	1.703	2.407	1.515	1.884	2.029	.343
2	8	.875	2.203	3.001	2.015	2.416	2.561	.406
2-1/2"	8	.968	2.703	3.595	2.515	2.948	3.093	.406
3"	8	1.015	3.203	4.191	3.015	3.480	3.625	.406
4"	6	1.156	4.203	5.420	4.015	4.544	4.730	.500

13 SH HEX NUT

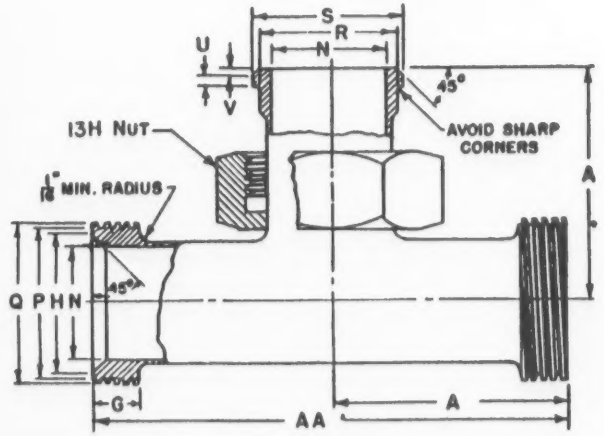
3-A Standard Sanitary Fittings 3-A-6300-11



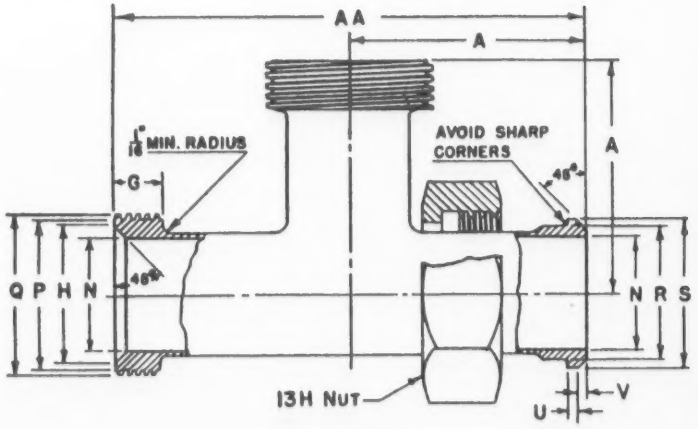
2-E BEND



7X TEE



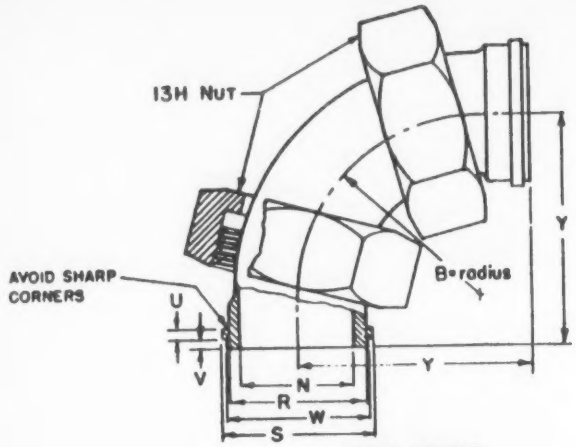
7AX TEE



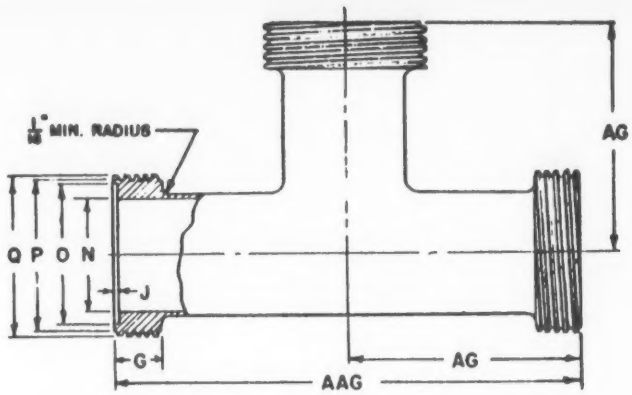
7BX TEE

SIZE	ACME THREADS PER INCH	A	AA	B	G_{MAX}	H	N	P	Q	R	S	U	V
1"	8	2"	4"	1-1/2"	9/16"	1-3/16"	.902"	1.317"	1.462"	1.160"	1.316"	3/16"	1/8"
1-1/2"	8	2-7/8"	5-3/4"	2-1/4"	9/16"	1-23/32"	1.402"	1.849"	1.994"	1.676"	1.848"	3/16"	5/32"
2"	8	3-23/32"	7-7/16"	3"	19/32"	2-1/4"	1.870"	2.381"	2.526"	2.192"	2.380"	1/4"	5/32"
2-1/2"	8	4-27/32"	9-11/16"	4"	23/32"	2-3/4"	2.370"	2.913"	3.058"	2.708"	2.912"	1/4"	3/16"
3"	8	5-29/32"	11-13/16"	5"	3/4"	3-5/16"	2.870"	3.445"	3.590"	3.224"	3.444"	9/32"	3/16"
4"	6	8-1/16"	16-1/8"	7"	7/8"	4-1/4"	3.834"	4.509"	4.695"	4.256"	4.508"	5/16"	1/4"

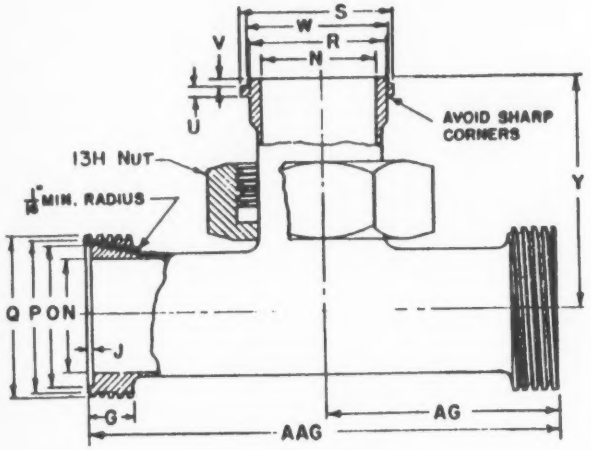
3-A Standard Sanitary Fittings 3-A-6300-12



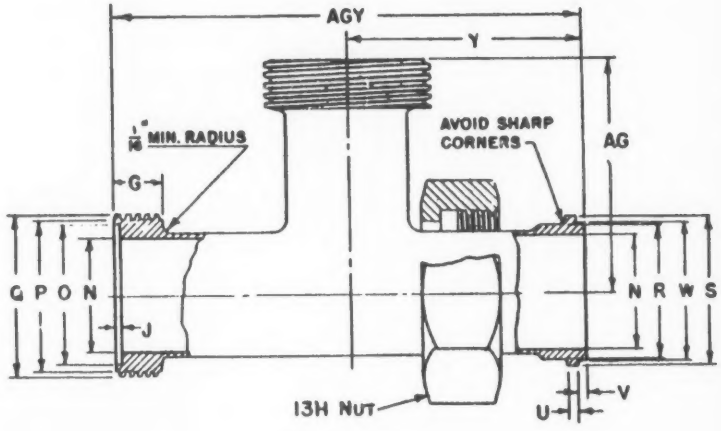
2EG BEND



7XG TEE



7AXG TEE



7BXG TEE

SIZE	ACME THREADS PER INCH	AG	AAG	AGY	B	G_{MAX}	J	N	O	P	Q	R	S	U	V	W	Y
1"	8	1-7/8"	3-3/4"	3-51/64"	1-1/2"	7/16"	.062"	.902"	1.219"	1.317"	1.462"	1.160"	1.316"	9/64"	3/32"	1.187"	1-59/64"
1-1/2"	8	2-3/4"	5-1/2"	5-33/64"	2-1/4"	7/16"	.062"	1.402"	1.750"	1.849"	1.994"	1.676"	1.848"	9/64"	3/32"	1.718"	2-49/64"
2"	8	3-9/16"	7-1/8"	7-3/16"	3"	7/16"	.062"	1.870"	2.250"	2.381"	2.526"	2.192"	2.380"	7/32"	3/32"	2.218"	3-5/8"
2-1/2"	8	4-21/32"	9-5/16"	9-3/8"	4"	17/32"	.062"	2.370"	2.750"	2.913"	3.058"	2.708"	2.912"	7/32"	3/32"	2.718"	4-23/32"
3"	8	5-23/32"	11-7/16"	11-1/2"	5"	9/16"	.062"	2.870"	3.312"	3.445"	3.590"	3.224"	3.444"	1/4"	3/32"	3.280"	5-25/32"
4"	6	7-7/8"	15-3/4"	15-49/64"	7"	11/16"	.062"	3.834"	4.312"	4.509"	4.695"	4.256"	4.508"	9/32"	7/64"	4.280"	7-57/64"

3-A Standard Sanitary Fittings 3-A-6300-13

Dairy, Food and Environmental Sanitation, Vol. 13, No. 12, Pages 751-757 (December 1993)
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3-A Sanitary Standards for Automatic Positive Displacement Samplers for Fluid Milk and Fluid Milk Products, Number 59-00 (08-17D)

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Automatic positive displacement samplers specifications heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A

SCOPE

A.1

These standards cover the sanitary aspects of air operated or electrically operated automatic positive displacement samplers (reference revised 3-A drawings, numbers 3-A-100D-1, 3-A-100D-2, 3-A-100D-3, 3-A-100D-4, 3-A-100D-5 and 3-A-100D-6) used on processing equipment and on equipment and lines which hold or convey fluid milk or fluid milk products. The sampler assembly may consist of a body, plunger, head, O-rings, seals, cylinder valves, diaphragm, springs and an air or electrically operated mechanism. It shall also include a closure plug or sample discharge port closure suitable for sealing the sample discharge opening when the sampler is not in use. These standards shall not cover automatic positive displacement samples used in aseptic or ulta pasteurization systems.

A.2

In order to conform to these 3-A Standards, air operated or electrically operated positive displacement samplers shall comply with the following in design, material and fabrication.

B

DEFINITIONS

B.1

Product: Shall mean the fluid milk and fluid milk products.

B.1.1

Sample: Shall mean that portion of the product removed for analytical purposes.

B.2

Surfaces

B.2.1

Product Contact Surfaces: Shall mean all surfaces that are exposed to the product or from which liquid may drain, drop or be drawn into the product.

B.2.2

Sample Contact Surfaces: Shall mean all product surfaces that are exposed exclusively to the sample once removed from the product stream or from which liquid may drain, drop or be drawn into the sample.

B.2.3

Nonproduct Contact Surfaces: Shall mean all other exposed surfaces.

B.3

Mechanical Cleaning or Mechanically Cleaned: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B.4

Electrodeposition: Shall mean coated to specific dimensions or processed to specified dimensions after coating*1.

C

MATERIALS

C.1

Product contact surfaces shall be of stainless steel of the AISI 300 Series*3 or corresponding ACI*4 types (See Appendix Section F.) or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types and is nontoxic and nonabsorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for gaskets, diaphragms, 0-rings, seals and parts used in similar applications.

C.1.2

*1 *QQ-C-320B Federal Specification for Chromium Plating (Electrodeposited) June 17, 1974 Amendment 4, April 10, 1987. QQ-N-290A, Federal Specification for Nickel Plating (Electrodeposited) November 12, 1971. Both documents available from the General Services Administration, 18th & F Sts., NW, WFCIA, Washington, DC 20405 (202-472-2205) (Use most current edition).*

Rubber and rubber-like materials when used shall conform to the applicable provisions of the current 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces In Dairy Equipment, Number 18-.

C.1.3

Plastic materials may be used for gaskets, diaphragms, O-rings, seals and parts used in similar applications.

C.1.4

Plastic materials, when used, shall conform the applicable provisions of the current 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment Number 20-.

C.1.5

Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.6

The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic.*2

C.1.7

Rubber and rubber-like materials and plastic materials having product contact surfaces that are a bonded coating or a covering shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.8

Plungers of air operated positive displacement samplers made of materials provided for in subsection C.1 may be covered with an electrodeposited coating of chromium.

C.2

All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D

FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix Section G).

D.2

The minimum thickness of electrodeposited coatings on plungers (see C.1.8) shall be not less than 0.0002 in. (0.005 mm). When these surfaces are other than stainless steel, the minimum thickness of electrodeposited coatings shall not be less than 0.002 in. (0.05 mm).

D.3

Automatic positive displacement samplers that are to be mechanically cleaned shall be designed so that the product and sample contact surfaces of the sampler, and all nonremovable appurtenances thereto can be mechanically cleaned and are easily accessible for inspection.

D.4

Appurtenances having product and sample contact surfaces shall be removable or they shall be mechanically cleanable in place and accessible for inspection employing simple hand tools available to operating or cleaning personnel.

D.5

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an assembled position or when removed. Removable parts shall be demountable using simple hand tools used by operating or cleaning personnel.

D.6

The primary seal or seat shall be located as close as possible to the product entry point and the passage length shall not exceed two times (2×
) the nominal product-entry port diameter.

D.7

All sanitary fittings and connections shall conform with those applicable provisions of current 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-. except as provided in Section E.1.

D.8

GASKETS

D.8.1

Gaskets having a product contact surface shall be removable or bonded.

D.8.2

Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.

D.8.3

Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6 mm) in depth or be less than 1/4 in. (6 mm) wide except those for standard 0-rings smaller than

---

*2 *The data for this series are contained in the AISI Steel Products Manual Stainless & Heat Resisting Steels, November, 1990, Table 2-1 pp. 17-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-9460) (Use most current edition).*

*3 *Steel Founders Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016 (708-299-9160).*

*4 *Adhesives shall comply with 21 CFR Part 175 - Indirect food additives. Adhesives and components of coatings. Document for sale by the Superintendent of Documents, U.S. Government Office, Washington, DC 20402 (202-783-3238) (Use most current edition).*

To receive information on membership with IAMFES Circle 360 on this card

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101	114	127	140	153	166	179	192	205	218	231	244	257	270	283	296	309	322	335	348
102	115	128	141	154	167	180	193	206	219	232	245	258	271	284	297	310	323	336	349
103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338	351
105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
106	119	132	145	158	171	184	197	210	223	236	249	262	275	288	301	314	327	340	353
107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

This second Reader Service Card is provided to allow co-workers to also respond to companies of interest.

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101	114	127	140	153	166	179	192	205	218	231	244	257	270	283	296	309	322	335	348
102	115	128	141	154	167	180	193	206	219	232	245	258	271	284	297	310	323	336	349
103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
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107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
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111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

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1/4 in. (6 mm) and those provided for fittings specified by Section D.7.

D.9

Radii

D.9.1

All internal angles of 135 degrees or less on product contact surfaces shall have radii of not less than 1/8 in. (3 mm) except that:

D.9.1.1

Smaller radii may be used when they are required for essential functional reasons such as pop-valve spring interfaces. In no case shall such radii be less than 1/32 in. (1 mm).

D.9.1.2

The radii in gasket grooves, gasket retaining grooves or, grooves in gaskets, except for those for standard 1/4 in. (6 mm) and smaller 0-rings, shall be not less than 1/8 in. (3 mm)] and those provided for fittings specified by Section D.7.

D.9.1.3

The radii in grooves for standard 1/4 in. (6 mm) 0-rings shall not be less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) 0-rings shall be not less than 1/32 in. (1 mm).

D.10

There shall be no threads on product or sample contact surface.

D.11

Any coil spring having product contact surfaces shall have at least 3/32 in. (2 mm) openings between coils including the ends when the spring is in the free position.

D.12

All product and sample contact surfaces shall be self-draining except for normal clingage when properly installed.

D.13

The sampler shall be capable of being automatically controlled in a manner that will prevent overfilling of the sample bottle.

D.14

Nonproduct contact surfaces shall have a smooth finish, free of pockets and crevices, and be readily cleanable and those surfaces to be coated shall be effectively prepared for coating.

E

SPECIAL CONSIDERATIONS

E.1

Special sanitary fittings may be used on samplers where interchangeability is not required. These special fittings must conform to the provisions of this standard with respect to material, finish, construction, thread dimensions (if used) and use of gaskets, but may have dimensions less than the face-to-face or center line-to-face dimensions in the drawings of current 3-A Sanitary Standards for Sanitary Fittings Used Number 63-. All product contact surfaces of such fittings shall be accessible for cleaning and inspection.

E.2

Automatic displacement samplers used in a processing system to be sterilized by heat and operated at a temperature of 250 degrees F (121 degrees C) or higher shall comply with the following additional criteria:

APPENDIX

F

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08 percent. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades or stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM*[6] specifications A351/A351M, A743/A743H and A744/A744M.

G

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section 0.1 herein. A maximum Ra of 32 micro in. (0.8 microm), when measured according to the recommendations In ANSI/ASME B46.1 - Surfaces Texture, is considered to be equivalent to a No. 4 finish.*[5]

H

DRAWINGS

These drawings are intended to demonstrate general principles only, and are not intended to limit individual ingenuity. The design used should conform with the sanitary requirements set forth in these 3-A Sanitary Standards. The following examples are included in this Appendix:

Fitting Name	Page	3-A Drawing Number
Displacement Sampler	754	3-A-59-00-01
Positive Displacement Sampler	755	3-A-59-00-02
Positive Displacement Sampler	756	3-A-59-00-03
Line Sampler	756	3-A-59-00-04
Line Sampler	757	3-A-59-00-05
Line Sampler	757	3-A-59-00-06

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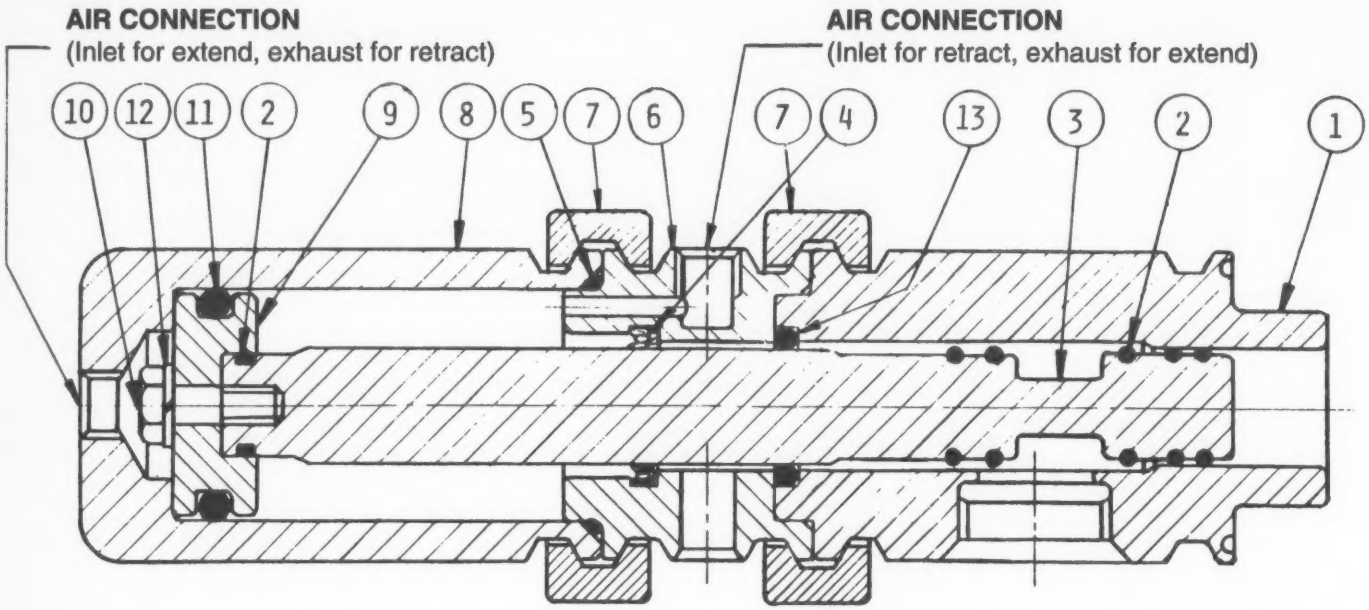
*[5] *Available from ASTM, 1916 Race St., Philadelphia, PA 19103-1187 (215-299-5400) (Use most current edition).*

*[6] *Available from the American Society of Mechanical Engineers, 345 E 47th Street, New York, NY 10017-2392 (212-705-7722).*

These standards are effective November 21, 1993 at which time the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17D Rev. 08-19D, (Automatic Positive Displacement Sampler) Parts I and 11 are rescinded and become null and void.



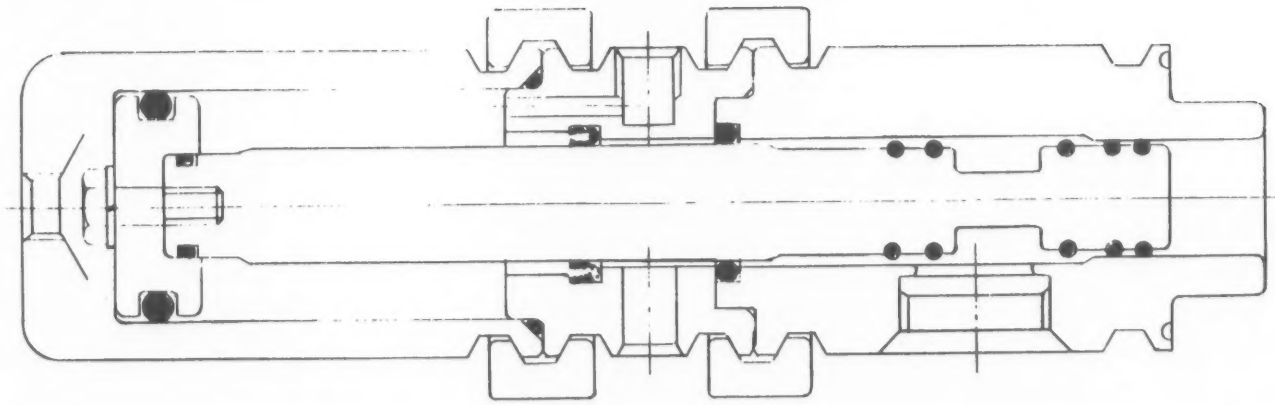
1. BODY
2. SEAL - PLUNGER
3. PLUNGER
4. SEAL - ROD REAR
5. SEAL - HEAD
6. HEAD
7. CLAMP
8. BARRELL
9. PISTON
10. CAPSCREW
11. SEAL - PISTON
12. LOCKWASHER
13. SEAL - ROD FRONT

NOTE:

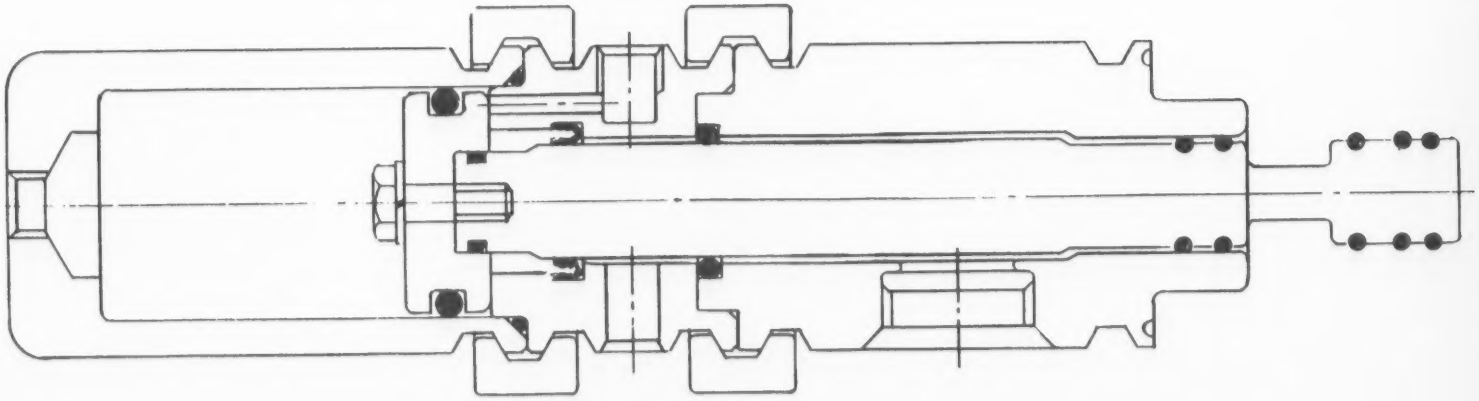
THE INTERNAL DESIGN SHOWN IS INTENDED TO DEMONSTRATE GENERAL PRINCIPLES ONLY AND IS NOT INTENDED TO LIMIT INDIVIDUAL INGENUITY, THE DESIGN SHALL CONFORM WITH THE GENERAL SANITARY REQUIREMENTS SET FORTH IN THIS 3-A SANITARY STANDARD AND SPECIFIC REQUIREMENTS FOR AIR OPERATED POSITIVE DISPLACEMENT SAMPLERS.

POSITIVE DISPLACEMENT SAMPLER

3-A Standard Sanitary Fittings 3-A-59-00-01



PLUNGER RETRACTED — DWELL POSITION BETWEEN CYCLES

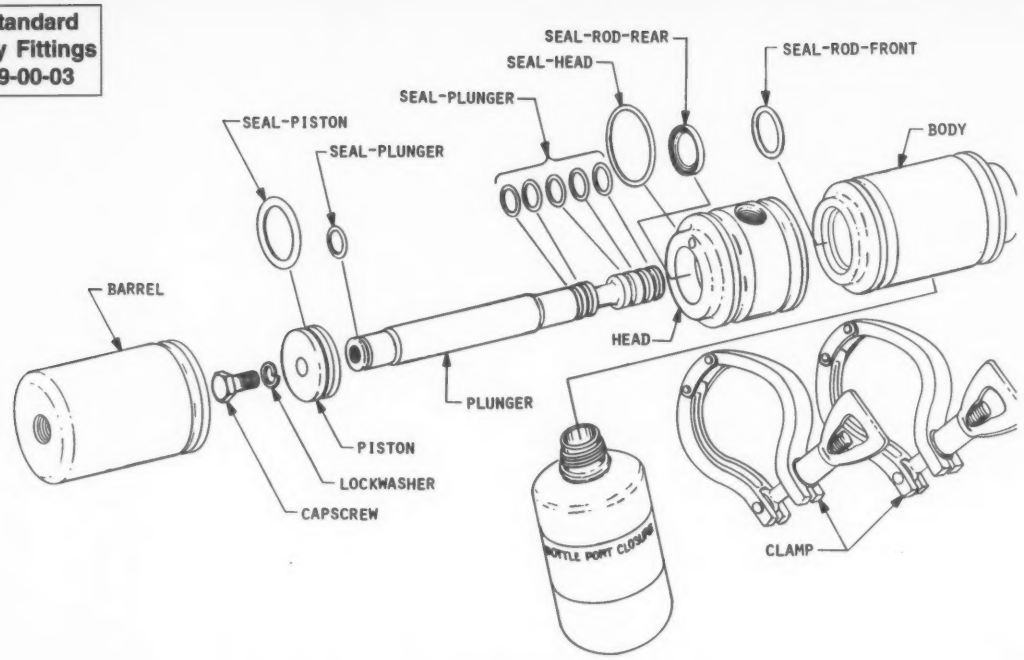


PLUNGER EXTENDED — DURING SAMPLE COLLECTION CYCLE

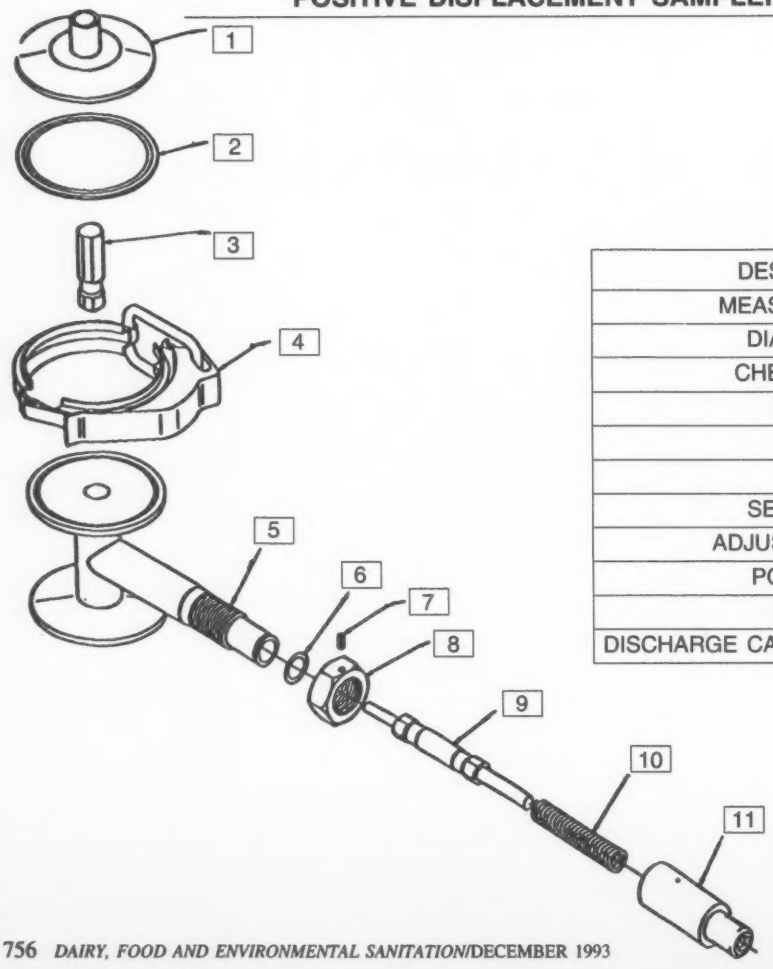
POSITIVE DISPLACEMENT SAMPLER

3-A Standard
Sanitary Fittings
3-A-59-00-02

3-A Standard Sanitary Fittings 3-A-59-00-03



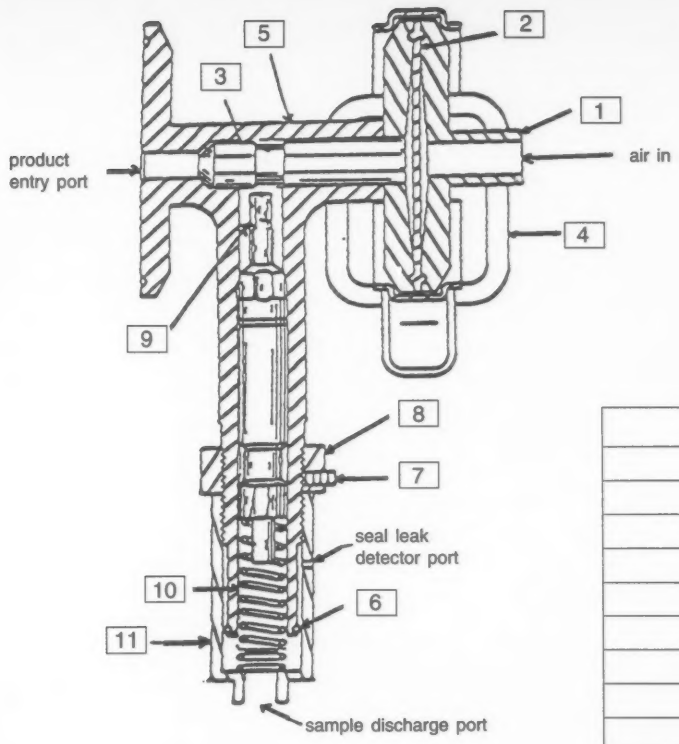
POSITIVE DISPLACEMENT SAMPLER



3-A Standard Sanitary Fittings 3-A-59-00-04

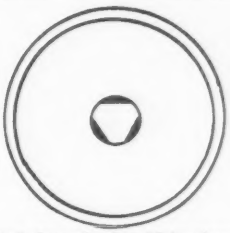
DESCRIPTION	ITEM
MEASURING CAP	1
DIAPHRAGM	2
CHECK VALVE	3
CLAMP	4
BODY	5
SEAL	6
SET SCREW	7
ADJUSTMENT NUT	8
POP VALVE	9
SPRING	10
DISCHARGE CAP SPRING TENSIONER	11

3-A Standard Sanitary Fittings 3-A-59-00-05

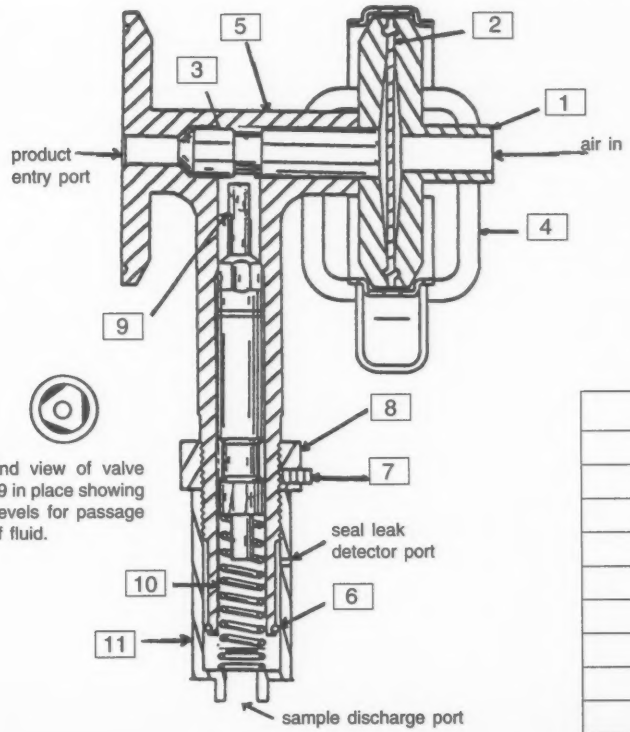


DESCRIPTION	ITEM
MEASURING CAP	1
DIAPHRAGM	2
CHECK VALVE	3
CLAMP	4
BODY	5
SEAL	6
SET SCREW	7
ADJUSTMENT NUT	8
POP VALVE	9
SPRING	10
DISCHARGE CAP SPRING TENSIONER	11

3-A Standard Sanitary Fittings 3-A-59-00-06



End view of valve #3 in place showing bevels for passage of fluid.



End view of valve #9 in place showing bevels for passage of fluid.

DESCRIPTION	ITEM
MEASURING CAP	1
DIAPHRAGM	2
CHECK VALVE	3
CLAMP	4
BODY	5
SEAL	6
SET SCREW	7
ADJUSTMENT NUT	8
POP VALVE	9
SPRING	10
DISCHARGE CAP SPRING TENSIONER	11

Coming Events

1994

January

•**3-5, Milling for Cereal Chemists**, sponsored by the American Association of Cereal Chemists, will be held in Manhattan, KS. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone: (612)454-7250; FAX (612)454-0766.

•**12-15, 1994 U.S. Dairy Forum**, sponsored by the International Dairy Foods Association, will be held at the Doral Resort and Country Club, Miami, FL. For more information contact IDFA, 888-16th Street, NW, 2nd Floor, Washington, DC 20006; (202)296-4250; FAX (202)331-7820.

•**25-28, Water Activity: Theory, Management, and Food Applications**, sponsored by the American Association of Cereal Chemists, will be held in St. Paul, MN. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone: (612)454-7250; FAX (612)454-0766.

February

•**22, Georgia Association of Food and Environmental Sanitarians Annual Meeting** will be held at the Holiday Inn Airport North in Atlanta, Georgia. The subject for the meeting will be "Hot Topics in Food Safety." For more information contact Mark Harrison at (706)542-2286.

March

•**7-10, Better Process Control School**. For more information please contact Robert Price (916/752-2194) or Pamela Tom (916/752-3837), Food Science and Technology Department, University of California, Davis, CA 95616-8598, FAX: (926)752-4759.

•**16, Annual Food Industry Conference** will be sponsored by the Food Science Department at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, Phone: (317)494-8279.

April

•**11-13, Microbiology and Engineering of Sterilization Processes** will be given at the St. Paul Campus of the University of Minnesota. For further information, contact Dr. William Schafter, course coordinator, Department of Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108, (612)624-4793.

•**12-13, Carolina's Association of Milk, Food and Environmental Sanitarians** will meet in Greenville, SC. For more information, contact Beth Johnson at (803)935-6201.

•**18-21, Purdue Better Process Control School** will be sponsored by the Food Science Department at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, Phone: (317)494-8279.

May

•**7-12, Food Structure Annual Meeting** will be held at the Holiday Inn Downtown City Hall, Toronto, Ontario, Canada. For more information, please contact Dr. Om Johari, SMI, Chicago (AMF O'Hare), IL 60666-0507, USA (or call 708-529-6677, FAX: 708-980-6698).

•**18-21, Purdue Better Process Control School** will be sponsored by the Food Science Department at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, Phone: (317)494-8279.

•**25-27, International Conference on Food Physics**, sponsored by the International Society of Food Physicists and the Editorial Board of Journal of Food Physics, will be held at the University of Horticulture and Food Industry, Budapest, Hungary. For further information contact A. S. Szabo, President of the Organizing Committee, H-1118 Budapest, Somloi Street 14-16, Phone: 361-1850-666/470, Fax: 361-166-6220.

July

•**8-15, Rapid Methods and Automation in Microbiology International Workshop XIV**, to be held at Kansas State University, Manhattan, KS. For more information contact Dr. Daniel Y. C. Fung at (913)532-5654, FAX (913)532-5681. A mini-symposium will occur on July 8th and 9th.

•**31-August 3, 81st Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians** will be held at the Hyatt Regency Hotel, San Antonio, TX. For more information contact: Julie Heim — Registration; Scott Wells — Exhibits; at (800)369-6337 (US), (800)284-6336 (Canada), or (515)276-3344.

October

•**12-13, Iowa Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Best Western Starlite Village (formerly the Ramada Hotel), Waterloo, IA. For more information call Dale Cooper at (319)927-3212.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 200W Merle Hay Centre, 6200 Aurora Avenue, Des Moines, IA 50322.

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